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THE KANSAS CITY REVIEW OF SCIENCE AND INDUSTRY.

EDITED BY

THEO. S. CASE.

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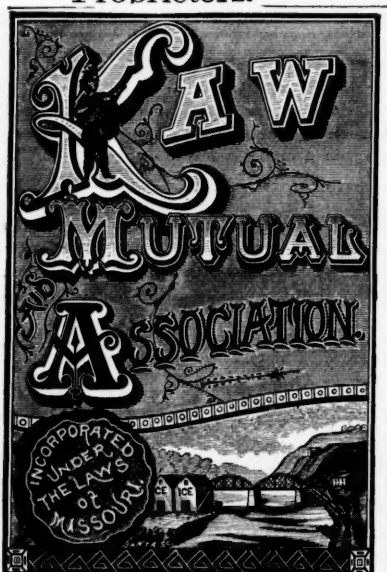

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REVIEW OF SCIENCE AND INDUSTRY,

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SCIENCE, MECHANIC ARTS AND LITERATURE.

VOL. VII. SEPTEMBER, 1883. NO. 5.

PHILOSOPHY.

THE BACONIAN PHILOSOPHY.

J. D. PARKER, U. S. A.

The great current setting through our times, on whose bosom the world has been borne these last three centuries, is the Baconian philosophy. Francis Bacon, the founder of this system, was born at London, January 22, 1561, and was pronounced by Pope to be the wisest and brightest of mankind. Next to the first century, I believe this was the greatest epoch in human history. Three or four centuries ago our ancestors were little better than barbarians. Excepting the imperfectly developed elements of a religious faith, we find among the nations of Europe, a phase of civilization little preferable to that of the Orient. Profound and painful is the darkness of that period in all that pertains to true philosophy and true science. "Out of that darkness and chaos," says a recent writer, "have come all our civil and religious freedom, all our philanthrophy and benevolence, all our diffused comfort and luxury, most of our good manners and morals, and all the splendid achievements of our modern scientific investigation."

The Aristotelian Philosophy had held the world in chains for two thousand years. The ten categories of Aristotle were supposed to be the *ne plus ultra* of human wisdom. A vast fabric of astronomic fable had been built up, circle on epicircle, which only needed the touch of truth to dissolve like the morning dew.

Bacon while yet a student at Trinity College, Cambridge, conceived a thorough dislike to the Aristotelian Philosophy. "They learn nothing," he says, "at the universities, but to believe. They are like a becalmed ship, they never move but by the wind of other men's breath, and have no oars of their own to steer withal." In the *Novum Organum*, he affirms that, "The studies of men in such places are confined and pinned down to certain authors, from which if a man happen to differ, he is presently represented as a disturber and innovator." In a tract, in after years, on the defects of the universities, he proposes that a college be established for the discovery of new truth, to mix, as he characteristically remarks, "like a living spring with the stagnant waters." The methods of the preceding ages, in a word, had failed, the masters had groped amidst the darkness for a true philosophy and a true science in vain. It was reserved for Bacon, during the quietude of the Elizabethan Age, to rise like a sun and shine upon the world.

The method of the Baconian Philosophy was nearly antagonistic to that of the preceding age. The fruitlessness of the ancient logic, as an instrument of discovery, had been fully proved. "We must first," says Bacon, "collect a natural history, that is, whatever be the subject we intend to investigate, we must first set down all the facts we can gain upon it. Having done this, we must classify these into tables, so that we may expunge those which are useless to the question, and gather the 'vintage' of those which are really significant. These significant facts are further to be scrutinized with respect to their relative value and import, and to be illustrated whenever it is practicable, by actual experiment. This being done, the law of the phenomena will at once begin to appear. Thus, our knowledge must rise from the bare facts, as they are presented to our senses, upwards, through different degrees of generalization, till the most general form thereof is ascertained, and the top stone of the pyramid laid upon it."

The spirit of the Baconian Philosophy is to determine what is truth. Pilate propounded this same question of olden time, but Bacon says he did not wait for an answer. Under the Inductive Philosophy nature is patiently interrogated for her facts and laws. Time with resistless sweep may measure ages before a problem yields solution. And should it defy all processes of the world nature will beget and rear up some gifted mind to carry forward those processes to a higher plane. And truth is to be found at all hazards. She is to be bought at any price. The universe is to be laid under contribution. The secrets of nature are be forced. New appliances are to be constructed and new methods of analysis invented until we stand, if possible, face to face with the Absolute.

The Inductive Philosophy also possesses a liberal spirit. Its faith is as large as the Universe of God. All things are believed possible until proved impossible. All things are believed true until proved untrue. Nothing is rejected that stands the touchstone of observation, comparison and experiment. The chaff-heaps of antiquity are to be winnowed and every grain tried.

It also possesses a fearless spirit. All truth must be consistent with itself. No two facts of the universe can contradict each other. No two laws of the

universe can disprove each other. The laws of life and chemistry may contend in building up and pulling down an organism, but if one prevails the other is held in abeyance. We must, therefore, be willing to follow, fearless of conflict, whithersoever truth may lead.

The spirit of the Inductive Philosophy is also fearless of human opinion. The most venerable errors of antiquity are to be removed. Systems that have been cherished and embalmed in the human heart for ages are to be overthrown. The most sacred shrines of the old world are to be desecrated, the idols in the temple of science to be thrown down and the foundations of the temple itself to be removed. Philosophies hoar with age, whose roots have been interwoven with all the past, and whose branches, like the Banyan tree, cover many nations, are to be rooted up.

The Inductive Philosophy lays its fearless hand even on Revelation, and gives it a new interpretation. The rocky leaves of the book of nature are turned, and the foot-prints of the Creator are traced as he went forth of old to draw out the world. The Author of Revelation piled the rocks, and the two records must agree.

The results of the Baconian Philosophy are almost beyond belief. But one department of science had attained any considerable development prior to the time of Bacon. The mathematics both pure and applied had been cultivated from the remotest antiquity. Euclid had gathered up the scattered elements of geometry, and raised it to a liberal science. Pythagoras had discovered the property of the right-angled triangle, if it had not been known to earlier Hindoo and Chinese authors. Hipparchus, the father of Trigonometry and Astronomy, had catalogued the stars by means of the naked eye, and invented the planisphere, and drawn parallels on the surface of the earth, leaving the results to Ptolemy his disciple. Archimedes had derived an approximate value of the quadrature of the circle. Thales had computed the length of the solar year and predicted eclipses. Even the Calculus, which has received such a wonderful development in modern times under Cauchy, Leibnitz, Newton, LaGrange, and Sir William Rowan Hamilton, is supposed to have had an Indian origin. The ancient world indeed contained nearly all the mathematical germs which have had such growth in modern times.

In Metaphysics, which occupied even a larger share of the attention of the scholars of antiquity, little progress had been made. Each successive generation had its disciples of Plato and Aristotle, who debated from age to age the same problems which ever divided those two rival schools of the Greeks. The science of mind had not been laid upon a true foundation, and no enduring fabric could be built thereon.

Of the Physical Sciences, not one except Astronomy had any real existence prior to the time of Bacon. Aristotle, the Plinys, and others had made vast collections of reported observations, but they contained more error than truth. Immense stores of traditional knowledge had been handed down from generation to generation, the Talmuds of science, which formed the capital of the savans of

those days. As the inductive philosopher seated himself before this heap of rubbish to winnow out the grains of truth, a mighty task was laid upon him. Every premise must be thoroughly established, every observation re-observed, every experiment re-conducted, and every comparison re-collated. Nothing less than a new creation lay before him. Well may the works of Bacon be christened, *Novum Organum*, and *Instauratio Magna*.

We come now to consider: What is the tendency of the Baconian Philosophy? History informs us of a certain Greek philosopher who died because he could not account for the tides on the Ægean Sea. His system of philosophy was not sufficiently comprehensive to include the true cause of tides. In a similar way sometimes we are not in possession of a system of philosophy comprehensive enough to account for the commotions of our age. Little do we suspect that out of some system of philosophy, perhaps of the mediæval or ancient world, rolls the wave that breaks over us.

Materialism has characterized our age, as is shown in our schools of science, philosophy and religion. Oken and Lamarck and DeMaillet, and the unknown author of the *Vestiges of Creation* represent various phases of materialistic science. In philosophy, from the days of Locke, sensationalism has had a controlling influence over the human mind in Great Britain, has spread more or less over the continent and has reached our own shores. Various phases of materialistic philosophy are suggested by the names of Comte, Hobbs, Buckle, Spencer, Mill, and Draper. In religion some wiseacres have recently discovered that man is wholly made of the dust of the ground, just a breathing lump of clay. Whence comes this materialialism which has characterized our age?

The process of the Baconian Philosophy necessarily excluded everything contrary to the order of nature. It was assumed that observation, comparison and experiment would exhaust the data of the material world, and that the logical faculty of the human mind could solve all the problems of the same. The inductive philosopher deals only with facts and the laws of the same, or, technically, with the uniformities of succession and co-existence which obtain among phenomena. Adopting the *a posteriori* method, he ascends from particulars to generals, priding himself as a man of facts who looks upon ideas as the chaff of things. He holds firmly to the doctrine of human nescience. To him the senses are the sources and measure of human knowledge, the only avenues to things without. Thus conditioned, he can know nothing of things as they are in themselves absolutely, but only as they appear to his conditioned intelligence. Unfolding the mere appearance or conditions of things, he goes forward to expound them as the primary and radical elements of knowledge itself.

Finite mind is conditioned also in regard to the extent of its knowledge. The universe is represented as a "polygon with but one of its infinitesimal sides adjusted to man's capacity, and every attempt to embrace, even in thought, the Infinite and Absolute, can only recoil upon him in mere negation and contradiction." Investigations conducted on such a plan would necessarily be narrow and materialistic in their tendency. Hence probably flows that stream of mater-

ialism which has rolled on for more than two hundred years, tinging science, philosophy and religion and sweeping away the fairest fabrics of human mind.

And herein, I believe, lies the chief defect of the Baconian Philosophy. With all its proud monuments of science and art, with all its civil and religious freedom, with all its philanthropy and benevolence, its diffused comfort and luxury, in a word, amidst all the glorious light of a new civilization which seems to be spreading over the surface of the whole earth, grows this Upas tree of materialism whose leaves go forth to poison the nations.

Hobbs, the immediate successor of Bacon, made sensation the only basis of knowledge, and reduced the whole process of scientific investigation to the doctrine of bodies. Comte attempted to generalize the great law of human progress into three distinct stages—the theological, metaphysical, and positive. He attempted to solve all natural phenomena by material causes, as if he had attempted to climb up to heaven by a ladder whose top rested upon the summit of some neighboring mountain. Ignoring the supernatural, he was left without God in the world. He devised a species of scientific religion in which humanity universal was worshipped in public, but woman, as possessing the best traits of humanity, in private devotions! Darwin attempts to break down the immutablity of species, by making the accidents of development greater than the law, and thus opens the gate to the Development Theory which aims to derive man by developing lower into higher forms of life. Assuming Spontaneous Generation and the Nebular Hypothesis, the unknown author of the *Vestiges of Creation* drew out a world by the Development Theory and peopled it without a God. Thus flows in devious channels this stream of materialism, washing many lands with its turbid waters, and wrecking many barques freighted with the fairest hopes of life.

We come now to consider, if it be not presumption, how the Baconian Philosophy may be *re-adjusted*, so that it shall produce the highest results for truth and the world.

All lovers of truth, let me say in passing, must deplore the efforts of some men who endeavor to arrest scientific investigation when it seems to be dangerous, or threatens a popular creed. All history shows that the progress of ideas cannot be prevented by persecution. Every department of science is full of workers who cannot be intimidated by fear, or kept back from their self-appointed tasks by hunger, thirst or privation. Fired by an enthusiasm for what they consider truth, approved in their acts by their own moral sense, nothing can stay the course of their investigations. Not only is opposition to scientific investigation fruitless, but it does not become a philosopher to interfere in the working of problems which are to find solution in themselves. The problems of philosophy are to be conducted on philosophical principles, and the problems of science on scientific principles. Problems in each department contain all the elements necessary for a perfect solution. All interference from without is unphilosophical and hazardous, and many prove disastrous. Neither should we impugn the motives of men of science, because they carry their processes to the last analysis, in a word, work out their problems pure, and leave their co-ordination to others.

It is reasonable to conclude that, if human wisdom suffice, this problem of Inductive Philosophy will be carried to its logical results. It seems necessary that modern scientific investigation should exhaust all material means before it has recourse to those forces which lie beyond the purely physical. Let the world travel this side-track of materialism untill they reach the utmost limit, and then they will be content to turn upon the highway of truth. When men have tried in vain to refer all natural phenomena to material causes, when they have fully proved a negative, they will become cognizant of truth, not reached through purely material processes, and faith will be recognized as the highest and best form of knowledge. And failure to reach the result through material means will demonstrate the existence of things immaterial, and will produce a wider, deeper and more universal faith, I believe, than has ever prevailed on the earth. It is logical to conclude, then, that some grains of truth were left hidden in the chaff-heaps of antiquity, not winnowed out by the Baconian Philosophy, whose presence is the life and power and inspiration of scientific formulas. And this is the supreme question of the age: How shall the Baconian Philosophy be readjusted so that it shall contain the truth, the whole truth, and nothing but the truth?

If we turn the page of history we shall find two great distinctive tendencies of the philosophic mind in which have various forms maintained their identity. The first is Realism, which takes its rise in Aristotle, and reappears under a different method in Bacon, and comes out in the Sensationalism of Locke, and in the Positivism of Comte. The other tendency is Idealism, which takes its rise in Plato, and flows on through the Transcendentalism of Germany from Kant to Hegel, and reappears in the Absolutism of Cousin. These philosophers differ in many respects, but may be classed in one form or another as defenders of these two great systems of Realism and Idealism, or of Positivism and Absolutism. Aristotle gave more place to the phenomenal; Plato and his disciples to the metaphenomenal. The realist deals more with what appears to be real to the senses, the idealist with the ideal. The realist prides himself as a man of facts. The absolutist deals with things as they absolutely are, absolved or loosed from contingent relations. He looks upon phenomena as the mere husks of truth, unfolds things by the inner light of the soul, and is not to be deceived by his senses. Realism ignores the Absolute, or resolves it into contradictions; claims that all knowledge must flow into the mind through the senses, and thus eliminates the supernatural and falls into materialism. Idealism would go behind phenomena, and seize hold of the very cause or essence of things by an intuition of mind, claims that what is conceivable is comprehensible, and by a species of omniscience rises above the world on the swift wings of thought, until it ends its airy flight in Mysticism and Pantheism. If any one doubts the power of philosophy over the religious world, look at the Mysticism and Pantheism of Germany where Idealism or Transcendentalism obtains, and at the Materialism of England and of our own country, where the Sensationalism or Realism has prevailed.

It must be evident to philosophic minds that Idealism and Realism are only complemental parts of one whole. Substantially, both philosophies are true in

what they affirm, and false in what they deny. These philosophies become false in becoming divorced from each other, and true as they shall be recomposed so as to hold each other in mutual check. The material system alone will drag the world down into an awful abyss, and Idealism alone will bear the world into clouds of Mysticism and Pantheism. But if the world can be buoyed up by Idealism and ballasted by Realism, it will move forward into a true science and a true philosophy, until the light of a pure religion shall cover the earth. If the Baconian Philosophy can be readjusted so that it shall induct all the necessary facts both of the material and immaterial worlds, then may we hope for that final system of philosophy which shall conserve all the truth of the past ages, and accept of all the truth that may be discovered in the ages to come. Let Realism be the stem, and Idealism the life, then shall the tree of a true knowledge spread out its branches and send forth its leaves for the healing of the nations.

ENGINEERING.

TRANSLATION OF A FRENCH REPORT OF THE PANAMA CANAL.[1]

IVON D. HEATH.

From all the reports of the officers of the Panama Canal Company the works there are very actively pushed. In the neighborhood of 6,000 workmen are found distributed in the various working-places. On its part the company is not inactive. It pursues its operations throughout the entire course of the line.

Two large American companies have each one obtained a special contract for constructing the way upon a course of seven miles—one upon the Atlantic side and the other upon the Pacific.

A certain number of miles of iron-way are already constructed, uniting the Panama railroad with the sites chosen for the deposit of the excavations. They are also excavating a new port about three miles from Aspinwall, the finishing of which will suffer but little delay.

As preliminary labor almost all the course of the canal has been cleared of the forest and staked out. Upon all the line they have constructed houses for the laborers and employes.

From the United States they receive daily at Aspinwall considerable quantities of material, consisting of locomotives, wagons for earth-working, woods for construction of frame-work, etc. etc.

Each steamer going from New York to Aspinwall has always something on board.

The health of the workmen is much better than last year. Inland at a cer-

1 Published at Paris, April 26, 1883, in *L'Exploration*, a Review of the Conquests of Civilization from all points of the globe.

tain distance from the coast the climate is more salubrious than upon the borders of the ocean.

The waters of the Chagres which would be able to innundate the canal will be restrained by a barrier which they will construct in the environs of Gamboa in one of the gorges of the mountain range.

All the machines of American construction sent to the isthmus have given full satisfaction to the company. Besides these machines the United States has furnished and will furnish yet a great quantity of other engines in order to complete the outfit.

As far as that which concerns the purchase of the Panama railroad, of the material and of the supplies of every nature made in the United States, the canal company has already paid in the neighborhood of 25,000,000 of dollars in gold.

Finally, the engineers of the company estimate that the canal will be entirely completed in seven round years unless, always, some events not altogether provided for should arise.

THE FLORIDA SHIP CANAL.

A Washington correspondent of the Nashville *American* brings to light the almost forgotten fact that the project of building a ship canal across the isthmus of Florida is by no means new. The subject was discussed and its feasibility determined as early as 1826.

A number of examinations and surveys of the proposed routes have been made. One referred to an ordinary canal of six feet depth, another to a large canal as part of a system of land-locked navigation between the Mississippi and the Atlantic, another to a ship canal of sufficient navigable depth to float the largest ocean-going steamer. The examinations have included all the available routes of the St. Mary's and St. John's Rivers, and all of the gulf coast outlets have been considered. The army engineers have heretofore selected the St. John's River route, while the present company favor the St. Mary's River as the eastern outlet. The first is said to be the shortest, but the latter the most available for safe communication. Congress in 1826 directed a survey to be made to ascertain the most eligible route across Florida by which to connect the Atlantic with the Gulf of Mexico by a canal for the transit of boats, and also ascertain the practicability of a ship canal. Two routes were directed to be examined—one from St. Mary's River to the Apalachicola River or bay, and the other from St. John's River by Vassoussa Bay, at the mouth of the Sewanee.

Another examination was ordered in 1852 of the St. John's route, and the report made demonstrated the practicability of the canal and an ample supply of water.

In 1879 Gen. Gilmore, under authority of Congress, made a survey of the St. Mary's River route. Gen. Gilmore's estimate of the cost of the work is much greater than that expected to be made by the new company. He places the cost

at $50,000,000, while the present company expect the work to be done inside of $30,000,000.

Its construction will give shorter routes between the ports of the Gulf of Mexico and those of the Atlantic coast, both domestic and foreign. Its use by vessels will avoid the dangers of the passage through the Florida Straits. The distances from New Orleans to New York by this canal would be shortened 497 miles, and between New Orleans and Liverpool 412 miles. Gen. Stone, the engineer of the company, is expected to have his report of the recent surveys ready in a few weeks, and a meeting of the directors will be held in this city sometime during the month of August to hear and act upon this report.—*National Republican.*

THE STORAGE OF WIND-POWER.

The great question of all questions at the present day, in the line of invention and mechanical application, is: How can we best turn to account the natural forces which are in play about us? Setting aside for the present the direct use of electricity as a motive power, we have two fluids at our command, air and water. Both have from time immemorial been pressed into the service of man, and yet even at this moment, with all the modern advances in practical science, we are only on the threshold of the workshop in which we ought to have full command. It is not too much to say that of the power exerted by the movements of water and of air throughout the world, the percentage utilized is so small as to be practically inappreciable. Let our inventors look to this, for it is a field which promises well.

The idea of using the power of water-falls at a distance, transmitting the energy by means of—say compressed air, or electric wires—has been often suggested and tried, but thus far with no very satisfactory results. The loss of power through the agents employed in transmission has been so great as to much impair the economic value. But let us take up another line of thought, and see if we cannot start some inventive brain into a plan which will bring out something practical. The power to which reference is made needs no transportation; it is ready at hand; it is simply the wind.

It seems incomprehensible that such a ready and potent agent should escape practical use so completely as it does. The probable reason for this is that the power is destitute of all uniformity, and has on that account hitherto been deemed unmanageable; sometimes furious, sometimes absolutely nothing, and at all times unsteady and capricious.

Before referring again to this feature, let us estimate for a moment the amount of power at our command, within a given space, *if we can only control and utilize it.* We will assume an area 40 by 150 feet, no larger than the flat top of many a manufacturing establishment, store, etc. Within this extent it is entirely practicable to place thirty-two wind-wheels, each twelve feet high by

eight feet in diameter, and so arrange them that each shall have full sweep of the wind from whatever quarter it may blow. The wheels here contemplated would revolve on vertical axles—or horizontal if preferred—with fixed blades, one-half shielded and turning so as to suit the direction of the current. They would need no attendance, no brake, no check, let them spin with the utmost fury of a gale, or lie still in a calm. Rapid motion could do no harm, only increasing their efficiency; whenever they turned they would do work, when they lay still they would do nothing. Each wheel would drive an air-pump of size suited to its power, and each stroke of the piston would send its given quantity of air into the common reservoir provided. That reservoir becomes then a magazine of compressed air whose energy is reported by the gauge, and is used by any of the means now so well known.

A wind-wheel of the size stated carries on each of its blades a surface of forty-eight feet. The pressure of wind in what is known as a "strong breeze" is about two pounds per square foot, and its rate of motion about 1,750 feet per minute. It is easy to see, therefore, that theoretically the efficiency of such a while in such a wind is safely reckoned at five-horse power.

But here comes in the difficulty, and it is *the* difficulty of all and must be overcome, or this power is of practically no value in the line of which we have been speaking. The power is capricious, and unless we can steady it no form of business can depend on it for service. How shall we *store* the power that may come to us by day or by night, Sundays and week days, gathering it at the time when we do not need it and preserving it till we do? This is the problem. Who is the man to solve it. Surely it should not be set aside as too difficult for trial.

Why should it not be dynamized into electricity? No distant transmission with its loss of energy comes into play, for a line of shafting can be driven directly on the spot. It is true the whole field of electric storage is yet too little explored to answer this question on the instant, but is it not worth considering?

Other modes of turning to account the compressed air, and using it only as needed, are also within our reach.

A factory or other building, of the size already given, with the wind-wheels on its roof, taking the average rate of the wind as it is known to be in our region and climate, has at its command, if it can *store* the power, at a fair and moderate estimate, 4,200 horse power per week, thus giving it a 70 horse power engine for six days of ten hours each. And this power is without engineer, without fuel, without labor; practically without expense.

Store the wind-power, and render it of even application, and all this is perfectly possible. Shall we admit that this cannot be done?—*W. O. A. in Scientific American.*

THE GUNNISON ROLLING MILLS.

This company is composed of such men as Gerard B. Allen, Ben. W. Lewis, J. W. Harrison and Thomas Howard, of St. Louis, and eastern manufacturers and capitalists of equal prominence. The company has purchased 2,000 acres of coal land in Gunnison County, Colorado, with five veins of an aggregate thickness of twenty-eight feet, making the property equivalent in production to an area of 10,000 acres. The coal is equal to the finest Pennsylvania anthracite, and when coked is one and a half per cent better than the best Connelsville. The coal is at Crested Butte, adjoining a valuable tract of land which abounds with iron ore of a quality that is not surpassed by the best Missouri, and yields a return of from sixty to sixty-eight per cent. These valuable deposits were acquired some time ago after the return of Mr. Ben. W. Lewis, who spent several months in examining the geological formation and the adaptability of the deposits to the manufacture of steel. On his recommendation the Gunnison Coal and Steel Company was formed for the purpose of conducting a general coking business and for the erection of steel works on a broad-gauge scale. Work has been commenced at the mines in the erection of houses and cottages for the employes, and before the end of the year it is believed that about 300 men will be engaged. Next year the steel works will be in operation and the force increased to several thousand hands. The capitalists at the head of the Gunnison Company are quite enthusiastic over the prospects, and say there is not another corporation which possesses such striking advantages to manufacture cheap steel. The coal and iron is situated on a down-grade on the lines of the Denver & Rio Grande and Union Pacific, about twenty miles from the city of Gunnison, where 150 acres of ground have been purchased for the rail-mills. There is a good demand for rails in the west, and with the numerous trans-continental trunk lines completed, an impetus will be given to steel and iron productions of every kind. The deposits of coal and iron are on the hillside, and can be easily reached without expensive shafting or drifting.—*Globe-Democrat.*

MINING SURVEYS.

The Commissioner of the general land office has ruled that the fact that a mining survey upon which is an application for a patent, conflicts with a prior survey does not prevent the application from including the conflicting area in his application, provided no application for patent upon such previous survey has already been made. Priority of application and not priority of survey governs in such matters. Of course a survey must show all conflicts with any previous surveys; but the mere showing of conflict does not divest the applicant of any legal rights.—*La Plata Miner.*

ASPHALTUM PAVEMENTS.

As the work of reconstructing Pine Street, St. Louis, with asphaltum has commenced, a description of the new pavement may not be without interest. The contract under which the work is being done, after providing for a foundation of cement, mortar and concrete, provides that the pavement shall be completed as follows:

Upon the concrete foundation thus prepared shall be laid the wearing surface or pavement proper, the basis of which or paving cement must be pure Trinidad asphaltum unmixed with any of the products of coal tar. The wearing surface shall be composed of: 1. Refined Trinidad asphaltum. 2. Heavy petroleum oil. 3. Fine sand, containing not more than 1 per centum of hydrosilicate of alumina. 4. Fine powder of carbonate of lime.

The Trinidad asphaltum (so-called), whether crude or refined, as found in this market, contains from 20 to 35 per cent of impurities, and is especially refined and brought to an uniform standard of purity and gravity.

The heavy petroleum oil, which may be the residuum by distillation of the petroleum oils as found in the market, generally contains water, light oils, coke and a gummy substance soluble in water. This petroleum oil is freed from all impurities and brought to a specific gravity of from 18° to 22° Beaume, and a fire test of 250° F.

By melting and mixing these two hydrocarbons, petroleum oil and asphaltum, the matrix of the pavement, called asphaltic cement, is manufactured, which cement has a fire test of 250° F., and at a temperature of 60° F. has a specific gravity of 1.19.

They are mixed in the following proportions by weight: Pure asphalt, 100 parts; heavy petroleum oil, 15 to 20 parts.

The asphaltic cement being made in the manner above described, the pavement-mixture is formed of the following materials, and in proportion stated: Asphaltic cement, from 12 to 15; sand, from 83 to 80; pulverized carbonate of lime, from 5 to 15.

In order to make the pavement homogeneous, the proportion of asphaltic cement must be varied according to the quality and character of the sand. The sand and asphaltic cement are heated separately to about 300° F. The pulverized carbonate of lime, while cold, is mixed with the hot sand in the required proportions, and is then mixed with the asphaltic cement at the required temperature and in the proper proportion, in a suitable apparatus, which will effect a perfect mixture.

The pavement-mixture, prepared in the manner thus indicated, shall be laid on the foundation in two coats. The first coat, called cushion-coat, shall contain from 2 to 4 per cent more asphaltic cement than given above; it shall be laid to such depth as will give a thickness of half an inch after being consolidated by a roller.

The second coat, called surface-coat, prepared as above specified, shall be laid on the cushion-coat; it shall be brought to the ground in carts, at a temperature of about 250° F., and if the temperature of the air is less than 50°, iron carts with heating apparatus shall be used in order to maintain the proper temperature of the mixture, it shall then be carefully spread, by means of hot iron rakes, in such manner as to give a uniform and regular grade, and to such depth that after having received its ultimate compression, it shall have a thickness of two inches. The surface shall then be compressed by hand rollers; after which a small amount of hydraulic cement shall be swept over it, and it shall then be thoroughly compressed by a steam roller, weighing not less than 250 pounds to the inch-run, the rolling being continued for not less than five hours for every 1,000 yards of surface.

The powdered carbonate of lime shall be of such degree of fineness that 5 to 15 per cent by weight of the entire mixture for the pavement shall be an impalpable powder of limestone, and the whole of it shall pass a No. 26 screen. The sand shall be of such size that none of it shall pass a No. 80 screen, and the whole of it shall pass a No. 10 screen. In order to make the gutters, which are consolidated but little by traffic, entirely impervious to water, a width of twelve inches next the curb shall be coated with hot pure asphalt and smoothed with hot smoothing irons, in order to saturate the pavement to a certain depth with an excess of asphalt.

ANTHROPOLOGY.

THE CAVE-DWELLERS OF THE SAN FRANCISCO MOUNTAINS.

GENERAL M. T. THOMAS.

A considerable number of these ancient dwellings are found in the vicinity of Flagstaff, and at one point, about eight miles northwest of that station, a village of fifty or more caves is still in a fair state of preservation.

This village is located on the point of a sharp ridge of land rising quite abruptly above the ordinary level of the mountain range about 500 feet. It is not by any means upon the highest part of the ridge, neither could it have been selected as a defensible position, but principally on account of the character of the material in which the caves have been excavated.

This material is partly lava scoria, an occasional solid lava rock, the whole substance being partially cemented by heat with earthy substances sufficiently compact to render the roof and wall of the caves safe and permanent.

The caves in this particular village cover a space about 200 feet along the

crest of the ridge and extend down its face, which descends at an angle of about forty-five degrees, for about 100 feet.

The largest cave, which is about fifteen feet square, is nearest the crest of the ridge, occupying the post of honor, overlooking all the balance of the village, and was undoubtedly the habitation of the governor, chief, or head man; the other caves are stuck in below each other so close that the rear of some of them are nearly under the front of those higher up the hill. As the descent is made the caves become smaller and are rudely constructed, or excavated, until they degenerate almost to ordinary bears' dens. This shows conclusively that even among the ancient cave-dwellers the autocrat from his fifteen-foot parlor, with its alcove sleeping quarters, looked down with contempt upon the ignorant poor folks whose six by eight single room was found a hundred feet below him on the hill-side.

All the larger and more respectable dwellings have from one to three or four little alcoves excavated from the sides of the main room; they are about four feet wide, three feet high, and extend back five feet, and furnished the sleeping accommodations for the family.

The excavation of these caves was probably quite a tedious operation, but certainly not a difficult one, as the material gives way readily to light blows of any pointed tool, and when a solid rock was encountered, it was either dug out and removed whole, or if part of it projected from the wall it was broken off by blows from a heavy stone. The only tools used by the excavators of these caves were rude hammers made by selecting a stone near the size and shape wanted, and then by rubbing or grinding, completing for use, and cutting a groove around it sufficiently deep to sustain a handle lashed to it with rawhide thongs. Some of these rude hammers are still found about the mines.

In constructing the cave a narrow approach is made, inclining downward until a sufficient elevation is presented, when a doorway about two feet wide by three or four feet high is formed; after leaving walls of about one foot the rooms are commenced and excavated of the required size.

Some of the large caves have a small passage-way leading from one to another; they are only large enough to allow a human body to crawl through, and as they are near the top of the rooms were properly more for convenience of neighborly gossip than anything else. The loose earth and broken stones taken from the caves was carried out and deposited over on the rear face of the ridge; the solid piles of stone were used to erect rough stone walls about the entrance to the caves, and along the ridge a wall is built continuously back of the whole village about three feet high. No mortar or plaster of any kind or description was ever used by these people.

The caves, considering what their age must be, are still in a remarkable state of preservation. The rains and winds have partially filled some of them but they can nearly all be entered without difficulty, and the walls and roofs are found in as perfect condition as the day they were abandoned.

As to the people who excavated and inhabited these dwellings, it is utterly

impossible to know much; yet the proof of a few characteristics are sufficiently established. They were a people of medium or rather inferior size, which is proved by the low erection of the rooms they inhabited and the alcoves in which they slept, neither being adapted to people over five feet high. They were a working people, fond of their homes and society, because they lived in compact villages, made pottery and cultivated the soil.

The ground is literally strewn with fragments of broken pottery in form and quality embracing all the styles of that made by the Pueblo Indians of to-day. This pottery has one and only one distinctive feature; it is, when painted at all, only painted on the inside.

It is sometimes roughly chased on the outside, but the coloring is on the inside. In all other respects the earthy pigments, mixed with chamber lye, furnished the material and it was laid on with sharp sticks for brushes, the same as the Indians of to-day do their work.

That they were agriculturists is proved by the Me-hot-tas (left in the caves) on which they ground their grain, and also the proximity of their villages to extensive areas of land well adapted to cultivation.

Their supply of water came from lakes and springs which have disappeared through various causes. Some of the lakes (or, as they are now called, tanks) were formed by the construction of dams across the foot of valleys—others were natural formations, but in all cases the marks are still plainly visible to the ordinary reader of nature's evolutions.

The only evidences they have left of any warlike implements are a few very small stone arrow-heads, which could only have been used in hunting small game.

The decaying remnants of the bones of both birds and animals, from the smallest wren or gopher up to the deer and antelope, are found by digging in the debris around their dwellings—but so far I have been unable to find the slightest trace of any human graves or skeletons, and although they were a people who used but little fire, probably none at all inside their dwellings, that they cremated the bodies of their dead seems probable.

These people deliberately abandoned their homes, taking with them all their household goods—they could not have been either destroyed or driven away, or more evidences of their possession would have been left behind.

These caves must have been constructed and inhabited within the last thousand years, and it is not at all improbable that they were still occupied five or even three hundred years ago.

The elements are not so gentle either in winter or summer among these mountain peaks as to leave such works—exposed as they are to their fury—without making serious efforts toward their obliteration, and yet these works are in a remarkable state of preservation to have stood even one thousand years. Aside from the actual dwellers in the caves, a part of these people lived in detached hamlets and single houses, scattered over the plain at considerable distances. The location and general characteristics of these lone huts would lead to the sup-

position that they were the temporary houses of herders, while the hamlets, ranging from three or four to a dozen houses, would indicate established settlement.

The houses were commenced by excavating one or two feet into the earth, the size required for the building, which was usually from six to eight feet wide and from twelve to twenty feet long, rough walls were built up of stone, and in some instances they were arched over with the same material and then the whole structure covered with earth, no mortar being used in the construction. Near these hamlets the now dry water tanks are always found, the same broken pottery and the same rude mills for grinding corn.

It would be an easy matter to invent legends and traditions to account for the disappearance of the cave-dwellers, but as plenty of such literature can be had by your readers at ten cents a volume, with your permission I will follow these people one step farther in their progress along the course of time, only saying in the conclusion of this article that as cave-dwellers they were a simple, peaceful, industrious people, knowing but few of the arts of civilization, but following these perseveringly and successfully until natural causes forced them to take a step in advance.—*Albuquerque Journal.*

REMARKABLE PROGRESS OF AMERICAN ARCHÆOLOGY.

The fourth annual report of the Archæological Institute of America has just been distributed among the members. It appears from this report that both the American and the classical researches of the Institute have been prosecuted with marked success. Mr. Bandelier is still at work in New Mexico, and in a letter dated San Juan, April 9, 1883, he outlines his further progress as follows:

"From Tucson, to which place I am now on my way, I shall go via Georgetown to Chihuahua and thence to Casas Grandes. After completion of my work there I shall return to Tucson, and thence ride down zigzag through Sonora Sinaloa, Michoacan, etc., to the City of Mexico. From this city I propose to turn upward again, following the route of Cortez to Vera Cruz, and thence along the coast, via Cintla, Misantla, Papantla, through the Huaxteco country to Monterey. In that manner I shall have surveyed the whole of Mexico north of the nineteenth parallel of latitude." The report further states that "should Mr. Bandelier be able to accomplish this proposed journey during the present year, one of the most important objects of the Institute in the investigations intrusted to him will have been attained. A general survey of the Pueblo settlements from their northern limit as far as the City of Mexico will have been made by a competent observer, and many points hitherto in doubt—not only in regard to the Indians, but also concerning the early Spanish discoveries and settlement of the country —will have been determined." As the modernization of New Mexico and Mexico is progressing rapidly, it is, indeed, fortunate that Mr. Bandelier's work was not longer deferred. Unhappily, however, the income of the Institute is so precarious that its labors will soon have to cease unless it receives more adequate

support. The valuable report by Mr. Bandelier upon his studies in Mexico in 1881 is partly in type, but its publication will have to be abandoned, as a sum of not less that $500 is needed to complete it.

The firman under which the investigations at Assos were carried on expired in May, and all that remained to be done was to close the works, to complete the drawings, and to make the division with the Turkish authorities of the antiquities discovered by the expedition. "The instructions originally given to the director of the expedition," says the report, "to deal with scrupulous honesty with the Turks, and to comply literally with the terms of the firman, have been strictly followed in spite of the example of other expeditions and of the temptations afforded to secure by underhand dealing antiquities of great interest to western scholars." The committee thinks that this course has been appreciated by the Turkish authorities, and one may well imagine their surprise at such unusual conduct, when it is considered that all former expeditions engaged without scruple in shameful contest in knavery, and then plumed themselves upon coming out best. The late Turkish Minister at Washington, Aristarchi Bey, has promised to promote a favorable consideration of the desire of the Institute that the sculptures of the temple at Assos should be ceded to it, and the United States Government, through its representative at Constantinople, has also interested itself in the matter. In order to promote the acquisition of as large a share of the antiquities as as possible, the Boston Museum of Fine Arts has placed $2,000 at the disposal of the Institute, the objects secured by the latter to be presented to the museum. Among the latter discoveries at Assos reported by Mr. Clarke, who is at the head of the expedition, the greatest interest seems to attach to a number of *figurini*, most of them archaic, but one of them, in Mr. Clarke's opinion, belonging to the best age of Greek art. The little statue is described as truly beautiful. A naked boy sits upon the back of a proudly out-stepping horse, in an easy, graceful posture. The animal has a plume of some kind upon his head, the bridle being painted in black lines. The boy's body is pink all over, his hair is a rich reddish brown, eyebrows and lids black. The figure * * * * is perfect in preservation; it has not a nick or scratch."

The second annual report of the Committee on the American School of Classical Studies at Athens, which is appended, records the successful organization and actual operation of the school, "with auspices in all respects favorable" —a somewhat enthusiastic assertion, in view of the pressing appeal for funds immediately following. The school has a yearly revenue of $3,500 contributed by fourteen collages, but an endowment is needed to render feasible the appointment of a permanent secretary. The committee "venture, therefore, to appeal to the richer portion of our community to provide the Institute with the means for this object. It would be a distinction greatly to be coveted to have established a foundation of this sort, which might perpetuate the name of its founder through successive generations as that of one who had not merely the means, but the will, to contribute toward the certain promotion of the higher intellectual interests of his country."

The financial condition of the Institute, generally speaking, is far from satistory, and its work, the carrying on of which is largely due to the self-sacrificing spirit of its agents, will have to be suspended unless there is a heartier response to the appeals for money. The committee state that "they are unwilling to repeat such appeals, and they have resolved that this shall be the last, at least until a considerable period of years shall have elapsed. * * * * * It cannot but be felt as a matter of reproach to a community so wealthy and so generally intelligent as our own, that, after the Institute has shown itself capable of conducting investigations so interesting and so successful as those which it has directed in this country and in Asia Minor, it is left without the means to carry out new designs of a similar nature, and is compelled to withdraw from fields in which so much still remains to be discovered, and to leave others to reap a harvest the fruits of which America ought to be desirous to secure, at least in part for herself."

The membership of the Institute consists at present of ninety-four life members, who pay $100 upon admission, and 251 ordinary members, whose dues are $10 a year. The list of foreign honorary members contains some of the names best known in the fields of classical archæology and history. The number of ordinary members has been considerab'y increased during the past year, especially in New York. The address of the Secretary, Mr. E. H. Greenleaf, is care of the Museum of Fine Arts, Boston, Mass.

PREHISTORIC REMAINS FROM SOUTHEAST MISSOURI.

Hon. Wm. McAdams, the geologist, has just returned from a sojourn of several weeks in southeast Missouri, and brought with him a large number of geological specimens and prehistoric remains, some of which are remarkable. He was camped a good part of the time at the Salt Springs on the Saline Creek, Mo. These curious salt springs seem to have been a great resort for prehistoric animals, such as the mastodon, mammoth and other curious creatures now entirely extinct. The vicinity for a circuit of several miles is cut up by deep ravines, the remains of the trails and paths of the animals in olden times going to the salt deposits. Besides the huge bones of mastodons, we were shown the portion of a jaw containing four perfect teeth, belonging, the gentleman thinks, to some extinct carnivorous animal much larger than our greatest bear. Other teeth of curious shape were shown. One of the most interesting specimens found on the Saline in connection with the remains of the mastodon, is a mass of singular substance known as adipocere, which seems to be tallow or fatty matter, assuming a peculiar form like hard castile soap. Under certain conditions fatty matter has been found, after great lapse of time, to have taken on a mineral character, and we have in this instance portions of the body of the animal preserved. Prof. Mars, the chemist, after analyzing portions of this singular substance, pronounces it adipocere, and most probably the mastodon's fat.

These springs were also a great resort of the aborigines and mound-builders, and the ground about the oozing brine, to the depth of three or four feet, is filled with the remains of the peculiar earthen vessels used by the mound-builders in salt-making. In the woods about, for the whole vicinity is covered with a forest, are many mounds and earthworks. From one small mound two of the earthen salt-kettles were obtained. They were shaped like shallow pans, an inch and a half in thickness and near four feet across the rim. In the vicinity a cavern was explored, which proved to have been a strong-hold or retreat for these ancient people, for weapons and implements of stone were found. Near the entrance, on the smooth white walls of the cavern, were a number of hieroglyphic characters deeply cut in the rock, tracks of human feet of unusual size, also of birds; the picture of a bird with outstretched wings, representations of the sun, moon, and other strange devices. These singular carvings were cut off the rock and brought away by the gentleman to add their interest to his great collection.—*Alton Telegraph.*

PREHISTORIC IMMIGRANTS.

M. de Nadaillac, who has recently published an excellent work on "Prehistoric America," says that in America, as in Europe, all serious proof fails of the existence of man at an earlier period than the quaternary. "From the earliest times," he continues, "themselves so obscure, we see with some astonishment the civilizations of the old and new world developing themselves, so to speak, in parallel lines, following the same phases, and arriving at the same results. What have been the relations between these races? Here, also, we are confronted by difficult problems; but though we are often reduced to hypothesis to explain them, we can confidently affirm that these relations have existed, that America has been successively peopled by diverse races of very different types. Among the common elements the most important, in number and influence, are the Asiatic immigrations. These immigrations of yellow brachycephalous races are incontestable, and have certainly lasted for ages. The greater part have taken place from the islands of the north; the several peoples of Nahuatl races, descending successively toward the south, are the most direct consequences of these migrations. But before the arrival of these Americans other men occupied the American continent for a considerable time; the Esquimaux of the north, the Botocudos and Patagonians in the south, may well be representatives of this race, crowded back, like the Basques and Finns in our own continent, by conquering strangers. We do not seek to conceal how precarious these hypotheses still are, and what need there is for confirmation of the proofs we possess. After long and patient labors we must end in the words of the American *savant*, 'The New World is a great mystery.'" —*London Athenæum.*

GEOLOGY.

THE U. S. GEOLOGICAL SURVEY OF THE LEADVILLE MINING DISTRICT.

The recent geological survey made by Prof. S. F. Emmons of the Leadville mineral district, has produced a marked change in opinion in regard to the extent of the mineral deposits of that camp, as well as to the nature and character of the deposits. His report for 1882, published by the Department of the Interior upon "The Geology and Mining Industry of Leadville, Lake Co., Colorado," has clearly and sharply defined the line of future investigation upon the subject. The effect of this valuable work in clearing the field of the numerous untenable theories that cumbered local investigation is just now becoming apparent in the direction and impetus it gives to exploration and development by mine-owners and operators. With the facts given in his report before them, they go forward with a confidence hitherto unfelt. Every stone is a sermon of meaning instead of an enigma when studied in the light of the facts collated by him. In the maps accompanying his report he lays bare the surface of the rocks, and presents them as they exist hundreds of feet below the surface presented to the eye, showing the geological formation with its out-crops, dips, faults, breaks, and trends, so perfectly that it is fast becoming a chart to direct exploration and development. He has cut the mountains into sections, presenting the broken and disturbed present condition of the strata, in contrast with the natural stratification existing before the great upheaval. With these maps and accompanying explanations the displacements in the formations so often occurring, no longer puzzle the miner.

But the most important feature of Prof. Emmons' work is in demonstrating the extension and existence of the mineral bearing formation to the south of the present producing area as far as Weston's Pass, and to the west under the City of Leadville to the Arkansas River. This he declares in the naturally cautious words of a scientific man, but his language leads by inference irresistibly to that conclusion. And recent developments in the territory lying south of Iowa Gulch and on either side of Empire Gulch have proven the correctness of his statements. No one can ride over the territory lying south of Iowa Gulch, as the writer has done, and note the exact likeness of the geological formation to that of the producing area adjoining it on the north, and see the great outcrops of iron-limestone, the exact counterpart of those on Fryer, Carbonate, and Iron Hills, without being impressed with the conviction that the slopes of Empire Gulch will soon develop into a second carbonate camp as busy and fruitful as the one at Leadville, adjoining it on the north.

In regard to the mineral deposit under and west of the City of Leadville he says: "The determination of the existence or non-existence of the blue limestone beneath the City of Leadville, is of prime importance, for the reason that so many rich bonanzas have already been developed at that horizon on its eastern borders, which it is reasonable to suppose once extended farther west, and that thus far the richness of the horizon seems to increase with its distance from the crest of the range. The evidence gathered upon this point will therefore be given in considerable detail."

"It is sufficiently well proved by the general geological structure of the region that the blue limestone originally extended to the west of Leadville, its probable limits being a line drawn from the mouth of the east fork of the Arkansas in a southeast direction to a point just west of Weston's Pass."

The value of this report is greatly enhanced by reason of its being done by and under the personal supervision of a government official.

The ore of Leadville is described by Mr. Emmons in his previous report, for 1881, as principally argentiferous galena and its secondary products, lead carbonate, silver chloride, and, less abundantly, lead sulphate or anglesite, pyromorphite, minium, zinc blende and calamine. The gangue, or material mixed with or holding the ore, consists of hydrated iron oxides or manganese oxides, silica and clay, all secondary products, the clay coming from the decomposed porphyry. The cavities in the limestone were made by the eroding solutions which introduce the ores; the action commenced at the top of the limestone adjoining the sheet of porphyry, and from this plane worked downward into the limestone. The materials of the ores were taken from "circulating waters, which, in their passage through the various bodies of eruptive rocks, took up certain metals in solution, and, concentrating along bedding planes, by a metamorphic or pseudomorphic action of replacement, deposited these metals as sulphides along the contact or upper surface, and to greater or less depth below that surface, of beds generally of limestone or dolomite but sometimes also of siliceous rocks." Dikes intersecting the ore-bearing formation "seem to favor the concentration of rich ore-bodies or bonanzas in their vicinity;" but the planes of faults afford no deposits of importance, and evidently for the reason that "their origin is later than that of the original ore-deposits." Thus the intrusion of the igneous sheets preceded the production of the ore-deposits and of the cavities containing them; and the production of the ores antedated the era of great disturbance which closed the Lignitic period or the Cretaceous, and which has continued to be followed by feeble movements until the present time; even since the opening, according to some evidence, of the Leadville mines.

These ores occur, according to the same authority, underneath a porphyry sheet and chiefly in cavities penetrating the lowest member of the carboniferous formation, the *blue* limestone—but occasionally also underneath the same porphyry in the *white* or silurian limestone and the Cambrian quartzite. The ore deposits penetrate into the limestone to varying depths from its plane of contact

with the overlying igneous rock, sometimes following courses of natural joints or cleavage planes.

The following tables, taken from the *Engineering and Mining Journal*, give the bullion output of Leadville for the year ended December 30, 1882:

QUANTITY.

	POUNDS OF BULLION.	POUNDS OF LEAD.	TONS OF ORE.	OUNCES OF SILVER.	OUNCES OF GOLD.
Total 1st quarter . . .	23,487,082	23,382,743	12,924	2,042,323	3,056
Total 2d quarter . . .	20,510,096	20,415,647	12,175	1,838,596	2,886
Total 3d quarter . . .	22,713,006	22,605,015	28,050	1,743,876	6,548
Total 4th quarter . . .	19,747,065	19,646,027	36,953	1,648,454	3,923
Total for year 1882 . .	86,457,349	86,047,412	90,101	7,273,249	16,413

VALUE.

	VALUE OF LEAD.	VALUE OF SILVER.	VALUE OF GOLD.	VALUE OF ORE.	TOTAL VALUE.
Total 1st quarter . . .	$1,169,037	$2,328,248	$ 61,120	$ 485,762	$ 4,044,167
Total 2d quarter . . .	1,020,779	2,093,301	49,720	599,059	3,773,772
Total 3d quarter . . .	1,130,251	1,988,142	130,960	1,326,111	4,575,334
Total 4th quarter . . .	942,977	1,827,561	78,457	1,885,134	4,734,129
Total for year 1882 . .	$4,263,044	$8,237,252	$320,257	$4,296,066	$17,127,402

Total for 1881 amounted to $13,170,576, showing an increase this year of $3,956,826.

A GEOLOGICAL GUIDE TO MINE PROSPECTORS.

PROFESSOR REUBEN WEISER.

* * * * * * *

We may inquire at this point as to the kind of rock, or rock formation, where silver or gold is likely to be found. This ought to be the first inquiry with the prospector who does not wish to throw away his time and money. The precious metals are found in nearly all the geologic formations, but in some more than others. Prof. J. D. Dana says, "silver veins often intersect trachite, porphyry and other eruptive rock, or the sedimentary formation in the vicinity of such rocks." Trachite and porphyry are ancient lavas, and are found only in eruptive formations and outflows. Feldspar is the principal ingredient of trachite. It is a rough rock and has a bluish yellow color.

Porphyry may contain silica and limestone. But silver is found most frequently in the gneissoid granite. Gneiss rock (pronounced nice) is a striated rock. It is found sometimes striped with black, red gray or white. Whenever you see a granite rock striped with these colors you may know that it is a gneiss rock. Silver is also found in amorphose granite; that is granite not striated. It is also found in limestone and in porphyry, in sandstone, in trap rock and in some shales. Silver and gold are found in all the geologic formations, from the oldest Azoic up to the most recent Tertiary. The principal gangue matter in silver lodes is calcite, which is carbonate of lime, pearl, fluor and heavy spar, which is sulphate of barium. This is easily known by its weight. It is about as heavy as

solid iron. The fluor spar is known by its brilliant colors of blue, green and yellow. The composition of heavy spar is 34–3 trioxide of sulphur, and 65–7 of baryta. Calcite in a vein is a good silver indication. You seldom see a good vein without it. Iron is also found in the gangue matter of gold and silver mines.

But it may be asked, are there any surface indications of silver or gold mines or lodes? To this we answer yes, sometimes, but not very often. At one time in the remote ages of the past, before the disintegration of the rocks took place, and before the age of the glacial drift period, most of the fissure veins might have been seen on the surface. But now the debris from the eroded rocks, and the fragments of rock that have rolled down from the mountains, and the glacial drift have covered the surface veins far out of sight. In Lake County, near and at Leadville, the glacial drift is from 30 to 309 feet deep. And of course in order to reach the rock you must go through that drift. This drift is found on the tops of the highest mountains around Leadville. I have found this drift on the top of the mountain that runs up from Little Evan's Gulch at an altitude of nearly 13,000 feet. This shows, I think, clearly that that mountain has been elevated since the Glacial Age. So where the debris of the eroded rocks or the glacial drift have covered the lodes the prospector has no guide to the veins. He must then, in order to succeed, resort to other means. But what other means are there within his reach? We answer, the mines that are already opened. From these he may form a pretty good idea of the place where other veins are likely to exist. He must study the composition of the rocks in which good mines are found, the character of the gangue or crevice matter, the dip and trend of good mines. All these things have their importance, and none of them should be overlooked. After a locality or a mineral bearing mountain has been pretty thoroughly explored by shafts and tunnels, it is no hard matter to tell on which side of the mountain the most mineral is likely to be found. It is the opinion of practical scientists that as a general rule the south and southeastern exposure of a silver bearing mountain is better than a northern or northwestern. I give this for what it is worth. My own experience agrees with this, and I think it will hold good in all mining countries. The practical geologist, in looking for mines, will of course be guided by the openings that have been made by others, and from the blunders they have made he can learn wisdom.

It would do the energetic prospector no harm to get himself a work on geology, say Steel's or Gray and Adam's, or Hitchcock's, and study it. Such a course would save him many a hard day's work. He would not then, as is now too often the case, be found digging and delving in places where, in the very nature of things, there can be no mineral. It is a false maxim to say that mineral may be found in one place as in another. It is only where geology has placed it, and nowhere else.—*Philadelphia Mining Journal.*

PROCEEDINGS OF SOCIETIES.

THE THIRTY-SECOND ANNUAL MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

This meeting was held at the beautiful and prosperous city of Minneapolis, Minnesota, commencing August 15th and closing on the 22d. In many respects the meeting was a very successful and satisfactory one, though the attendance was smaller than usual. Most of the prominent members were present, however, and the papers read were fairly up to the standard of previous sessions.

On Wednesday morning at 10 o'clock the general session of the Association met at the University of Minnesota, about two miles from the centre of the city, and was called to order by the retiring president, Dr. J. W. Dawson, of Montreal. The chapel was well filled with members of the Association and citizens. Seated upon the platform were the past presidents of the Association, the present officers, Bishop C. D. Foss, Gov. Hubbard, Mayor Ames, President W. W. Folwell, Dr. A. F. Elliott, Mr. C. M. Loring and Geo. A. Pillsbury, of the local committee.

The retiring president, after calling the meeting to order, called to the chair the president elect, Prof. C. A. Young, of Princeton. Prof. Young stepped forward and thanked the Association for the honor conferred and promised to discharge the duties of the position to the best of his ability. We are met here, he said, for an important purpose. We are not here for mere amusement or the gratification of our tastes, but to consider carefully great scientific questions which are of political interest and value to the world. We must be industrious, conscientious and assiduous in our work and discussions, and give all to our sessions the dignified character which becomes us as scientists. We shall do some playing as well as much working, and I trust our meeting will be full of interest and of lasting value.

Bishop Foss then offered prayer, invoking the Divine blessing upon the Association, its deliberations and all the varied interests represented by it.

After this addresses of welcome were made by Mr. Geo. A. Pillsbury, the chairman of the Local Committee, Governor Hubbard, Mayor Ames and Dr. Folwell, President of the State University, which were formally and handsomely responded to by President Young.

After some detail business and the reading of the Annual Reports of the various officers the meeting adjourned and the several sections met and organized for their regular work in the different rooms assigned to them in the University building.

In the evening Prof. J. W. Dawson, LL.D., the retiring president, delivered

the annual address before a large audience in the Westminster Church, one of the finest churches in the West, upon the subject:

SOME UNSOLVED PROBLEMS IN GEOLOGY.

It is not practicable to give the full address, as it would make at least thirty pages of the REVIEW, but it is believed that the abstract given below covers its main points:

Ladies and Gentlemen of the American Association for the Advancement of Science:

There is no department of physical or biological science with which geology is not allied, or at least upon which the geologist may not presume to trespass. When, therefore, I announce as my subject on the present occasion some of the unsolved problems of this universal science, you need not be surprised if I should be somewhat discursive.

Perhaps I shall begin at the utmost limiits of my subject by remarking that in matters of physical and natural science we are met at the outset with the scarcely solved question as to our own place in the nature which we study, and the bearing of this on the difficulties we encounter. The organism of man is decidedly a part of nature. We place ourself, in this aspect, in the sub-kingdom vertebrata and class mammalia, and recognize the fact that man is the terminal link in a chain of being, extending throughout geological time. But the organism is not all of man, and when we regard man as a scientific animal we raise a new question. If the human mind is a part of nature, then it is subject to natural law, and nature includes mind as well as matter. On the other hand, without being absolute idealists, we may hold that mind is more important than matter, and nearer to the real essence of things. Our science is in any case necessarily dualistic, being the product of the reaction of mind on nature, and must be largely subjective and anthropomorphic. Hence, no doubt, arise much of the controversy of science and much of the unsolved difficulty.

Fortunately, as a geologist, I do not need to invite your attention to those transcendental questions which relate to the ultimate constitution of matter. This record of geology covers but a small part of the history of the earth and the system to which it belongs, nor does it enter at all into the more recondite problems involved; still it forms, I believe, some necessary preparation at least to the comprehension of these. But if we are content to start with a number of organisms ready made—a somewhat humiliating start, however—we still have to ask, How do these vary so as to give new species? It is a singular illusion in this matter, of men who profess to be believers in natural law, that variation may be boundless, aimless and fortuitous, and that it is by spontaneous selection from varieties thus produced that development arises. But surely the supposition of mere chance and magic is unworthy of science. Varieties must have causes, and their causes and their effects must be regulated by some law or laws. Now it is easy to see that they cannot be caused by a mere innate tendency in the organism itself. Every organism is so nicely equilibrated that it has no such

spontaneous tendency, except within the limits set by its growth and the law of its periodical changes. There may, however, be equilibrium more or less stable. I believe all attempts hitherto made have failed to account for the fixity of certain, nay, of very many, types throughout geological time, but the mere consideration that one may be in a more stable state of equilibrium than another, so far explains it. A rocking stone has no more spontaneous tendency to move than an ordinary boulder, but it may be made to move with a touch. So it probably is with organisms. But if so, then the causes of variation are external, as in many cases we actually know them to be, and they must depend on instability or change in surroundings, and this so arranged as not to be too extreme in amount and to operate in some determinate direction. Observe how remarkable the unity of the adjustments involved in such a supposition; how superior they must be to our rude and always more or less unsuccessful attempts to produce and carry forward varieties and races in definite directions. This cannot be chance. If it exists it must depend on plans deeply laid in the nature of things, else it would be most monstrous magic and causeless miracle.

Another caution which a palæontologist has occasion to give with regard to theories of life, has reference to the tendency of biologists to infer that animals and plants were introduced under embryonic forms, and at first in few and imperfect species. Facts do not substantiate this. The first appearance of leading types of life is rarely embryonic. On the contrary, they often appear in highly perfect and specialized forms, often however of composite type and expressing characters afterwards so separated as to belong to higher groups. Again, we are now prepared to say that the struggle for existence, however plausible as a theory, when put before us in connection with the productiveness of animals and the few survivors ot their multitudinous progeny, has not been the determining cause of the introduction of new species.

No conclusions of geology seem more certain than that great changes of climate have occurred in the course of geological time, and the evidence of this in that comparatively modern period which immediately preceded the human age is so striking that it has come to be known as pre-eminently the ice-age; while in the preceding tertiary periods, temperate conditions seem to have prevailed even to the pole. Of the many theories as to these changes which have been proposed, two seem at present to divide the suffrages of geologists, either alone or combined with each other. These are (1) the theory of the precession of the equinoxes in connection with the varying eccentricity of the earth's orbit, advocated more especially by Croll; and (2) the different distribution of land and water as affecting the reception and radiation of heat and the ocean currents, a theory ably propounded by Lyell, and subsequently extensively adopted either alone or with the previous one. One of these views may be called the astronomical, the other the geographical. I confess that I am inclined to accept the second or Lyellian theory for such reasons as follows: (1) Great elevations and depressions of land have occurred in and since the Pleistocene, while the alleged astronomical changes are not certain, more especially in regard to their probable

effect on the earth; (2) When the rival theories are tested by the present phenomena of the southern polar region and the North Atlantic there seem to be geographical causes adequate to account for all except extreme and unproved glacial conditions; (3) The astronomical cause would suppose regularly recurring glacial periods of which there is no evidence, and it would give to the latest glacial age an antiquity which seems at variance with all other facts; (4) In those more northern regions where glacial phenomena are most pronounced, the theory of floating sheets of ice, with local glaciers descending to the sea, seems to meet all the conditions of the case, and these would be obtained, in the North Atlantic at least, by very moderate changes of level, causing, for example, the equatorial current to flow into the Pacific, instead of running northward as a gulf stream; (5) The geographical theory allows the supposition not merely of vicissitudes of climate quickly following each other in unison with the movements of the surface, but allows also of that near local approximation of regions wholly covered with ice and snow, and others comparatively temperate, which we see at present in the north. This last consideration suggests a question which might afford scope for another address of an hour's duration—the question how long time has elapsed since the close of the glacial period. Recently the opinion has been gaining ground that the close of the ice age is very recent. Such reasons as the following lead to this conclusion: The amount of atmospheric decay of rocks and of denudation in general which have occurred since the close of the glacial period are scarcely appreciable. Little erosion of river valleys or of coast terraces has occurred. The calculated recession of waterfalls and of production of lake ridges lead to the same conclusions So do the recent state of bones and shells in the Pleistocene deposits and the perfectly modern facies of their fossils. On such evidence the cessation of the glacial cold and settlement of our continents at their present levels are events which may have occured not more than 6,000 or 7,000 years ago, though such time estimates are proverbially uncertain in geology. This subject also carries with it the greatest of all geological problems, next to the origin of life, namely, the origin and early history of man. Such questions cannot be discussed in the closing sentences of an hour's address.

In conclusion, science is light, and light is good, but it must be carried high, else it will fail to enlighten the world. Let us strive to raise it high enough to shine over every obstruction which casts any shadow on the true interests of humanity. Above all, let us hold up light and not stand in it ourselves.

The exercises of the day and evening were pleasantly supplemented by a public reception by the members of the Association, under the auspices of the local committee, in the parlors of the Nicollet House. The reception was entirely informal. After listening to Prof. Dawson's address, the members of the Association proceeded to the hotel where they found awaiting them a large company of Minneapolitans, including many leading citizens, with ladies.

ANTHROPOLOGY.

SCOPE AND VALUE OF ANTHROPOLOGICAL STUDIES.

PROF. OTIS T. MASON.

Abstract: Read before Section H, Wednesday, August 16th.

Professor Mason began by saying that everything which presented itself before human consciousness is subjected to a process of weighing and measuring. Before giving up their lives to any study men wish to know what good, or honor, or happiness would result. The speaker then defined anthropology to be the application of the instrumentalities and methods of natural history to the inductive study of man, not merely taking a superficial view, collecting old things because they are old, nor running after curiosities, but the patient investigation of mankind, just as if our race were a group of unintelligent animals. The horse was adduced as an example of what patient study would accomplish when concentrated upon a single group. A series of topics was drawn up, the consideration of which would constitute a science of hippology. Returning to the human race it was assumed that humanity had an origin and therefore a whole series of problems would arise concerning that fact; many of these questions were stated by the speaker. The past has a record between the beginning and the first recorded history, written in graves and remains of art, another great congeries of questions grew out of this fact, and the professor stated the principal among them. The human animal has a life-history, a biology; it has a mind-history, a physchology; a history of expression, a glossology; a history of segregations, an ethnology; a progress in artistic refinement and ability, a technology; a social evolution, or sociology; an eventful life in the presence of the unseen world, a mythology; a balancing of harmonies with the outer world, or hexiology. Considering each of these topics briefly, Prof. Mason stated what were the latest and most imporant queries under each head concerning which the anthropologists are vexing their minds.

After this epitome of the topics included in anthropology it was next shown what are the advantages to be gained by so much nicety of observation: by such multifarious and extended records, and by so much philosophizing. The first advantage is that all studies are improved by study. Men will study man. It is a most fascinating subject, has been pursued always, and ever will be to the end of time. The mission of the anthropologist, therefore, is not so much to encourage the study of man, but to regulate it so that some permanent good, some beneficent truths, will be the result. All sciences began with vain speculations—astronomy with astrology, chemistry with alchemy, theology with mythology.

While paying a glowing tribute to those who worked with insufficient light, Prof. Mason called attention to the fact that twenty years antiquate a man nowadays as effectually as did centuries in former times. Quite an extended report was given of the work now being thoroughly done in every department of anthropology throughout our country.

The second benefit of anthropology is its good effect on human weal. The study of climatology already begins to enable those who direct political movements to thwart the destructive energies of nature and to add to the natural selection of physical forces the effective co-operation of human design. A better knowledge of the religions of peoples puts in the hand of the statesman and the missionary a more effectual means of amelioration. Those who have to deal with uncivilized people on reservations and in colonies, win their confidence better by knowing their political organization. The history of civilization is in one sense a history of industrial accretions which can be read backwards by the elimination of inventions in the inverse order of their addition. So much is said about race and race prejudice that only by a correct analysis of what race really is can we hope to arrive at a proper disposition of the problem. Thus throughout every part of this anthropologic domain, knowledge wide and deep is to humanity both a safeguard and a positive boon.

The third and most interesting point in this part of the paper was that anthropology afforded opportunity for the exercise of the most diversified talent. The speaker showed that every one in the audience, by his occupation or natural gifts, was thus qualified to be an expert in anthropology. Some very interesting illustrations of this point were given, such as the identification of all the birds in the mound-pipes by Mr. Henshaw; the explanation of the designs on the shell ornaments, by Mr. Holmes, the artist; the explanation of the true history of savage invention, by Mr. Seely, a patent examiner, and the order of elaboration in savage weapons, by Gen. Pitt Rivers. Mothers, teachers, physicians, tradesmen, lawyers, legislators, and clergymen, were urged to conduct a series of anthropologic experiments.

The last advantage to which Prof. Mason alluded was the assistance which such studies lend to philanthropy and legislation. Science now has her missionaries as well as religion. It was the demonstration by science that the Indians are not dying out which revolutionized public sentiment in their favor. The genuine sympathy necessary to constitute a good scientific observer redounds to the permanent good of those who are under scrutiny.

The closing portion of the address related to the future of anthropology. In the study of the anthropocosmos, as in other studies, we are brought face to face with the inscrutable. In these voyages of discovery we have no right to expect that we shall ever find a passage to the ultimate truth. With all our sciences comes the consciousness of new ignorances. There is more known to be unknown now than when the wisest men knew that they did not understand many things well known to us. So will it ever be. We are just on the threshold of applying the instruments of precision to the study of man. But there is no *Ultima*

Thule in science. Still, we should not utter the words *ignoramus et ignoramibus* as a wail of despair. To all they should be the sweet voice of hope. Fresh, buoyant, vigorous science should feel that it is on a pleasant journey, whose destination may remain unknown, but every mile of whose progress unfolds new vistas of beauty and variety in nature, each transcending its predecessors.

THE MISSOURI RIVER MOUNDS, CONSIDERED FROM A GEOLOGICAL STANDPOINT.

JUDGE E. P. WEST.

Read before Section H, Friday, August 18th.

In treating of the Missouri River mounds and mound-builders, I shall confine myself, mainly, to my personal observations, made in the fall of 1881 and summer of 1882, during an exploration of the river banks between Omaha and St. Louis. The expedition was undertaken for the Kansas City *Times*, and an account of it was published in that paper in a series of nine articles pending the work.

This paper will be confined, in a great measure, to the age of the mounds as indicated by the geological formations with which they stand invariably associated. In extent, these monuments of the past ages, in one unbroken chain, form conspicuous land-marks, crowning the river-bluffs from Omaha, Neb., to St. Louis, Mo., and, as the writer believes, upwards on the Missouri River and and upward and downward on the Mississippi River, and on their respective tributaries on both sides, co-extensive with the Loess and Terrace formations bordering them. They are found on the highest loess bluffs overlooking the streams, and on the old terraces of the Champlain era near them, and nowhere else; without exception, they are associated with these geological formations and none other.

But this fact would be without significance were it not for other facts with which it stands connected. The Loess hills are still standing in graceful sequence along the rivers, and the Terraces form broad and picturesque steps in the valleys, and have stood so for long ages inviting, as they are still inviting, man's restless energy to erect his monuments upon them. Cities, towns, villages, and beautiful country homes, are now continually springing into being upon them at the touch of modern civilization; but history records the age of this work, and we speak of it in our daily intercourse. Not so with the other monuments I have alluded to. We question history about them, but it is silent. We question the seers and wise men of the aborigines of the continent, but they, too, and their traditions, are silent; they can give us no farther account of them than, that "they were there in the time of our fathers;" and their traditions can say no more. They are older than history, they are older than tradition; and in the absence of both history and tradition how can we approximate their age. The builders have long reposed in the silence of death, and their stage of action is buried in the

deep recesses of the past, but they alone can tell us, not by words or writing, but by their work and by their sepulchres, which have kindly preserved their remains from the ravages of time for our instruction.

Our structures and monuments upon the earth's surface are not confined to the loess deposits and terrace steps, but are spread alike, indifferently, over all the geological formations. The modern Indian erects his wigwam upon the recent alluvium, and the valleys and plains, wrought out by all the ages, with equal indifference, showing no preference, whatever, for the loess bluffs, or the terrace tables. Not so with the extinct race of mound-builders of the Missouri River. They chose the summits of the loess hills, or the terrace plains, only, for an abiding place. Why this preference? It could hardly be that any peculiarity of the soil or the formation itself influenced them, and we must look to extrinsic conditions to explain their choice.

It is a fact not disputed by geologists, that the loess deposit was made in lakes of still water, and that terraces were formed by shore-washings, and exposed by subsequent elevations of the land or subsidence of the water. May we not look, then, to these lakes for an explanation of the manifest and invariable preference shown? Mav we not regard the Missouri River mound-builders as a race of lake-shore dwellers, made so from considerations of a food supply?

Many facts point to this conclusion, besides the persistent association of the mounds with the geological formations before named, *e. g.*: the black vegetable mold is as thick on the mounds as over the adjacent lands. The trees growing on them are as large and as old as those of the surrounding forests. But all this might be covered by a period of five hundred years, and would not, necessarily, extend back to the lake era. But other facts, which may be superadded, are more conclusive. Stone implements have been frequently found in the loess from three to thirty feet below the suface, under conditions which leave but little doubt of their having been lost in the lakes of the Champlain era, and covered in where found, by the super-accumulation of their deposits. Human bones were found in Kansas City in a loess hill-side, not remote from the summit, eighteen feet beneath the surface, and within ten feet above the base of the deposit, under conditions that lead to the belief that they were engulfed and subsequently buried in the same way.

The bones, teeth, and tusks, of extinct mammals, and three or four varieties of Helix, identical with living species, are often encountered at depths varying from five to more than a hundred feet below the surface.

A vase of antique pottery was found at White Cloud, Kansas, in a loess hill, near its summit, fifteen feet below the surface, in clay which had every indication of having remained undisturbed from the time of its primary deposit. Another vase, precisely similar in every respect, was found in an artificial mound, standing on the summit of the bluff overlooking that place and the Missouri River, about one-half mile distant from where the first named vase was found, but at a much greater elevation of the bluff. Another vase, of the same antique work, was found, in sinking a well, on a broad, low terrace, at Manhattan, Kansas, at

a depth of nine feet. Dr. Parr, of Weston, Missouri, found a similar vase in opening a mound situated on the summit of the bluff overlooking that place and the Missouri River. The vase contained within it the vertebræ of a fish, and some shell beads. The chief importance to be attached to Dr. Parr's find, as I have elsewhere, in another article, stated, is in the contents of the vase. It has been the custom of barbarous and semi-barbarous people to make provision for their departed friends, on their supposed long journey to the spirit land. The food provided is that which the people habitually use, and such a people invariably use the food which is most accessible to them. Hence, our modern tribes, who inhabit fertile districts, such as Missouri and Kansas, subsist almost entirely upon terrestrial animals, because such food is more accessible to them than any other; and they would never have thought of sustaining a friend departing for the land of spirits upon fish. But at the close of the loess deposit, prior thereto, and for a considerable time after its completion, conditions were different, and fish must have been more abundant and more accessible than terrestrial animals, hence the subsistence provided for the tenant of the Weston mound for his subsistence to the mystic land.

It is not probable that any monument of primitive man will be found east of the Rocky Mountain range, and north of the fortieth degree of north latitude, older than the Champlain era, unless it may be in caves, or scattered in the glacial drift. It is highly probable, on the other hand, that all of the mounds in Kansas, Nebraska, Iowa, Missouri, Illinois, Wisconsin, Michigan, Indiana, and Ohio, north of that line, are about the same age, and correspond, within a few hundred years, at most, with the age of the Missouri River mounds, and stand associated with equivalent geological formations, *i. e.*, they were all built fringing upon lakes which had a synchronous existence in the Champlain era.

In view of these facts, we have reason to believe that the occupancy of the mound-builders began prior to the subsidence of the Missouri River and Kansas lakes, and that it was not continued long thereafter. It must have begun previous to the subsidence, otherwise the remains and implements of this mysterious people would not be found in positions, as they are found, in the undisturbed primitive deposits. The changed conditions which followed the subsidence precludes the idea of their continuance much later without changed habits and modes of life.

Their ingress was, probably, from the south, and extended northward after the close of the glacial period, however, and whenever man originally appeared on the continent. Outward, physical conditions determine, in a great measure, the modes of life of a primitive people. And this simple race, turning northward after the close of the ice reign, found the warm Champlain lakes filled with fish, inviting an occupancy along their hospitable shores. Here they erected their mysterious abodes, and drew their principal food-supply from the lakes. But time moved on with its relentless changes, the lakes were drained, and the supply of food they afforded was diminished, while, on the other hand, the productions of the land increased in a corresponding ratio. Conditions were changed,

and the lake-dwellers, consequently, suffered extinction, or were forced to change their mode of life. Their distinctive characteristics, at any rate, ceased long before the European touched foot upon this continent. Were they exterminated by neighboring nomadic tribes, or did they become themselves nomadic in their habits? We may never know, but their total and tragic extinction is most probable.

BIOLOGY.

AGRICULTURAL BOTANY.

DR. E. L. STURTEVANT.

Read before Section F, Thursday, August 17th.

If kitchen garden plants be closely studied in many varieties, it will be found that selection has differentiated the various natural species in accordance with desired uses.

It will be noticed that while there is a striking uniformity within varieties in those portions of the plant which have not been selected for improvement, there is a great variation between these portions which have secured attention on account of their uses. Thus, in forty-five varieties of onions growing side by side, the foliage is all similar, yet the bulbs vary in size, color, shape and habit of formation. The twenty-two varieties of carrots present like foliage, yet unlike roots. In sixty kinds of lettuce a likeness of bloom and great unlikeness between plants while of edible size. Among sixty-six kinds of tomatoes, a sameness of bloom, certain varieties in foliage and growth habit, and a very marked diversity in form of fruit borne. It follows from a careful observation of over 1,100 named varieties of kitchen-garden plants, that two series of variations can be distinguished: The least marked, the normal variations that occur between the parts not subjected to conscious selection as being of little account for use; the very marked, or artificial variations that are produced by conscious selection exerted upon the parts which are valued for their use, and which selection has been exercised most stringently upon form. It will be further noticed that according as selection for the same purpose has been exercised upon the various parts a parallelism of development has taken place between plants of different species, genera and orders. This parallelism of development points to a unity of arrangement in the forces by which the correspondences are produced.

The effect of selection concentrated upon visible forms has been to produce and fix changes from the natural plant to such an extent as in cases to mask the original species so that historical data must supplement morphological data in order to connect the genetic record. Thus, for illustration, there at first seems no specific connection between certain cultivated kales, cabbages and cauliflowers,

while a specific connection of these with the ruta-baga seems uncertain. It is only as these forms are produced through the sowing of the seed of Brassica Oleracea that their close connection becomes manifested.

In the case of some long cultivated plants the original prototype is unknown, and can be sought but by conjecture. Such is the case with many of our cereals, with lettuce, etc.

In some plants selection has been exerted in different directions, as, for illustration, with the beet, whereby the root-beet and the leaf-beet have been produced; the celery and the celeriac; the parsley and the Hamburg parsley, the onion and the top-onion, etc.

It is clearly evident that conscious selection is a powerful agency for the changing of form, and by long exercise can overcome the form or type affixed by nature to a species. The direction of this change and its consequences are determined by man in the direction toward usefulness to him as distinct from nature's intent toward the maintenance of the species.

We hence have a different set of motives governing the domesticated plant than those which govern the feral plant. The individuals of a natural species cluster about a common type, held in place by a natural environment, reacting with the force transmitted by heredity. The individuals of an artificial (domesticated variety) cluster about a common type formed and continued through man's agency, whereby an assisted environment reacts upon heredity modified by selection in influencing plant form, and in the feral plant, genetic resemblance, as observed or inferred, furnishes a method of classification in accord with the law of evolution as expressing harmonies of action of special causes. Through the reaction of natural heredity with natural environment, classes are already formed for us and but await our discovery.

In the domesticated plant, the power of intelligence to eliminate, modify and direct the action of natural laws under a given purpose, introduces a new factor to influence plant growth, and forms designed for uses most genetic, producing resemblances in those portions of the plant where change means value to man. In accordance with the law of evolution, but under a new application, form becomes paramount as a motive over genesis; usefulness, freed from the motive of self-maintenance, becomes paramount over the motive of continuance of the species. Through the reaction of an assisted heredity with the artificial environment, including conscious selection in artificial plants, classes are already formed for us, and but await our discovery. If in nature, classes are formed through genetic data as paramount, then the natural system is in force for classification. If, under art, classes are formed through human selection based upon form as paramount, then an artificial system of classification is as truly scientific, and expresses, in like manner, as true a set of relations, but relations of a different character, as does the natural system. In a scientific artificial arrangement we seize upon a quality or qualities which yield us information as to the motive or development for uses, and furnish signs of natural laws as modified and influenced by man, and form of selected parts furnish the key; in a scientific natural arrangement we seize upon a quality

or qualities which through correlations yield signs of natural laws, and the floral organs as indicative of the motive of the wild plant's life furnishes the key. If these views are correctly stated, then it is seen that an agricultural botany as an annex to the natural botany is imperatively required for the purpose of furthering classification and identification of domesticated plants, and such an annex must vary in its methods as widely from the methods of the natural botany as cultivated plants vary from feral plants, the key to the motive being in one case the use, while in the other the floral organs.

GEOLOGY AND PALÆONTOLOGY.

THE GLACIAL PERIOD.

PROF. I. C. WHITE.

Read before Section E, August 17th.

[The Geological Section is universally conceded to be the one in which the newest and most interesting scientific facts have been brought out. A matter of special interest which it has discussed has been the theories of the glacial period of North America. It may be interesting to briefly review the history of these theories. It was noticed three or four decades ago by the eminent naturalist, Agassiz, that through the United States north of the Ohio River, there were scattered formations of gravels, boulders, sandstones and clays, which were in geological positions and relations similar to those at the foot of European glaciers. These deposits were utterly dissimilar from any of the prevailing formations of the surrounding country. The question then was, whence came these strange visitors? It was found that to the north of these deposits were large formations of the same kind of material, which seemed to indicate that some mighty force had torn these boulders, etc., from their original beds and carried them south, sometimes a mile, sometimes 1000 miles. The hypothesis was then suggested that this was the work of a number of geologists who had made desultory surveys of these formations, but no scientific survey of them had been made up to seven or eight years ago, when Prof. Chamberlin, then of Beloit College, and Prof. Cook, of New Jersey, set out to make a thorough study of this glacial hypothesis. Prof. Chamberlin went to Europe to examine the beds of glaciers there in order to thoroughly prepare himself for original investigation. The study of these formations was exceedingly careful and painstaking, extending from Cape Cod and Long Island to the Sierra Nevada Mountains. Up to this time, two theories had each their advocates—that these formations were dropped from glaciers moving south, and that they were deposited by icebergs. The work of these two explorers, however, brought forth such an array of facts as to positively show that this was the work of ice, and that the glacier theory was the only tenable one.

In this exploration the professors received valuable assistance from Mr. Warren Upham, now Prof. Winchell's assistant at the Minnesota State University. Prof. Chamberlin is still prosecuting this search under the United States Government, and is recognized as one of the most thorough and erudite geologists connected with the government survey. Prof. Chamberlin and Mr. Upham have read papers in the geological section on this subject, which papers have already been reported. A valuable addition to the literature was a paper read Friday, August 17th. It was written by Prof. I. C. White, and considered the surface deposits along the Monongahela River and other West Virginia tributaries of the Ohio on the hypothesis of a glacial dam across the Ohio valley near Cincinnati. The following is the paper in full:]

In a paper read before the Boston Society of Natural History, March 7, 1883, Rev. G. F. Wright has shown that the southern rim of the great northern ice sheet crossed the Ohio River near the site of New Richmond, a few miles above Cincinnati. Mr. Wright believes that one effect of this invasion of the Ohio valley by the glacial ice, was to form an immense dam of ice and morainic debris, 500 or 600 feet high, which effectually closed the old channelway, and set back the water of the Ohio and its tributaries until rising to the level of the Licking River divide, it probably found an outlet through Kentucky, around the glacial dam. As this divide is 500 or 600 feet higher than the present bed of the Ohio at Cincinnati, Mr. Wright states that the site of Pittsburg would have been submerged to the depth of 300 feet; and adds: "It remains to be seen how much light this may shed upon the terraces which mark the Ohio and its tributaries in western Pennsylvania."

Having resided for nearly a score of years in the valley of the Monongahela River, the writer is necessarily familiar with its terraces and surface deposits in general; and in reply to the above query of the eminent glacialist, would answer that his admirable work throws a flood of light upon the Monongahela terraces, and proffers for them, and the deposits along other tributaries of the Ohio, the only satisfactory explanation that has ever been advanced.

Of course, if the Ohio River was ever so obstructed for any considerable period of time, it would follow, as a necessary result, that many of the tributary streams and the Ohio itself, above the limit of the dam, would have their old valleys silted up with vast heaps of trash—clay, sand, gravel, boulders, drifted logs, and other rubbish—carried down by the streams from the regions not sheeted with ice, and dumped into the great inland lake-stream which extended from Cincinnati far up toward the sources of the Monongahela.

That the valley of the latter stream has been refilled with trash during some period of its history to a height of 250 or 300 feet above its present bed, the evidence is most conclusive, for the remnants of this deposit still cover the surface to a great depth in long lines of terraces extending from Pittsburg, Pa., southward along the river to Fairmont, W. Va., a distance of 130 miles, and very probably much further, as I have never examined the river valley above the latter town.

The striking peculiarity of these terrace deposits is that they suddenly disappear at an elevation of 1050 or 1075 feet above tide, not a single rounded and transported boulder ever being found above the latter horizon, though occurring in countless numbers below this level.

The hills along the river often rise 300 or 400 feet higher than the upper limit of the deposits, so that there can be no mistake about the elevation at which the terrace deposits disappear. The composition of these great heaps of surface debris is, along the immediate valley of the river, a heterogeneous mixture of sand, clay, gravel, rounded boulders of sandstone of every size, from an inch in diameter up to four feet, pieces of coal, leaves, logs of wood, and every other species of rubbish usually transported by streams. Back from the channel of the river, however, and especially where the surface configuration would make quiet water, there occur thick deposits of very fine, bluish white clay, in which great numbers of leaves are most beautifully preserved. These clays have been extensively used for the manufacture of pottery at Geneva and Greensboro, Pa., and also to some extent at Morgantown and Fairmont, W. Va. Though the clay deposits occur at nearly every horizon they are purest near the upper limit of the terraces, and these are consequently the only ones that have hitherto been much explored.

In the vicinity of Morgantown, terraces of transported material occur at the following approximate (measured by barometer) elevations:

	Feet above River.	Feet above Tide.
First terrace	30	800
Second terrace	75	865
Third terrace	175	965
Fourth terrace	200	990
Fifth terrace	275	1065

The accompanying cross section of the Monongahela valley, near Morgantown, exhibits the relations of the terrace deposits to each other and to the river channel.

The first terrace is the present flood plain of the river, consisting principally of fine sand, mud and gravel. It seems to possess some respectable antiquity, however, since Mr. Walter Hough, one of my students, dug some teeth and bones from five feet below its top, which were identified by Prof. O. C. Marsh as the remains of a species of peccary, an animal that has not inhabited the region in question within the American historic epoch.

All of the other terraces have thick deposits of transported material wherever the original contour of the surface has favored its preservation from erosion. From the top of the fourth terrace Mr. Keck dug a well through seventy feet of clay, gravel and boulders without finding bed-rock. He also encountered logs of wood in a soft or semi-rotten condition near the bottom.

Many other wells on the third terrace have been sunk to depths of twenty and thirty feet without reaching bed rock.

The fifth terrace of this Morgantown series mark the height to which the pre-glacial valley of the Monongahela was silted up partially or entirely during the existence of the glacial dam at Cincinnati, since as already stated, no clay beds, rounded boulders or other transported material are ever found above its top, but instead only angular fragments of the country rock, and thin coverings of surface material which has accumulated *in situ*.

Owing to the considerable elevation—275 feet—of the fifth terrace above the present river bed, its deposits are frequently found far inland from the Monongahela, on tributary streams. A very extensive deposit of this kind occurs on a tributary one mile and a half northeast from Morgantown, and the region, which includes three or four square miles, is significantly known as the "flats." The elevation of the "flats" is 275 feet above the river or 1065 feet above tide. The deposits on this area consist almost entirely of clays and fine sandy material, there being very few boulders intermingled. The depth of the deposit is unknown, since a well sunk on the land of Mr. Baker passed through alternate beds of clay, fine sand and muddy trash to a depth of sixty-five feet without reaching bed-rock. In some portions of the clays which make up this deposit, the leaves of our common forest trees, are found most beautifully preserved. Whether or not they show any variations from the species now growing in that region, the writer has not yet had time to determine, but when a larger collection has been obtained, this subject will receive the attention that it deserves, since if the date of the glacial epoch be very remote, the species must necessarily show some divergence from the present flora.

Of animal remains the only fragment yet discovered in this highest of the terraces is the tooth of a mastodon, dug up near Stewartstown, seven miles northeast from Morgantown.

The other tributaries of the Monongahela, on which the writer has noted the clay and other deposits of the fifth terrace, are Decker's, Dunkard, Whitely, Muddy, and Ten Mile Creeks, and in each case the deposits disappear at the same absolute level at which they cease along the river.

The Great Kanawha River, another principal tributary of the Ohio, draining a region that was never glaciated, also exhibits water-worn boulder deposits which disappear at 200—300 feet above the present level of that stream, though I have not determined the exact limit.

The glacial dam at Cincinnati presents a complete explanation for the origin of Teazes valley, an ancient, deserted river channel twenty miles long and one to two miles wide, which leaves the great Kanawha fifteen miles below Charleston, W. Va., at Scany, and passing through Putnam and Cabell Counties, extends to the valley of Mud River, a tributary of the Guyandotte which empties into the Ohio at Huntington.

This valley, although having an elevation of 200 feet or more above the Kanawha, is filled to a great depth with rounded boulders sandstone, chert, cannel coal, and other trash which has plainly been transported down the Kanawha from above Charleston, so that although it was clearly seen that the water of the

Kanawha had once found an outlet to the Ohio by the way of this valley and the Mud and Guyandotte Rivers, yet why this ancient channel should have been abandoned for the present much more circuitous one had always remained a mystery until Mr. Wright furnished the key in his discovery of the great ice dam at Cincinnati. For it is now cler that such a barier would set back the water of the Kanawha until rising above the divide which have previously separated it from Mud River, it sent an arm across to the Ohio by way of the Guyandotte, fifty miles below, where the other arm and main stream reached the same river at the present mouth of the Kanawha, thus converting portions of Putnam, Mason and Cabell Counties into a large triangular island, the base of which was formed by the swollen Ohio, and the sides by the two arms of the Great Kanawha. The melting away of the Cincinnati dam withdrew the water from the western or Mud-Guyandotte arm of the Kanawha, leaving the abandoned valley high and dry, but littered up with transported trash as we now see it, while the Kanawha continued on to the Ohio in its present and pre-glacial outlet.

A summary view of these and other facts in the writer's possession seem to prove beyond any reasonable doubt that Mr. Wright's hypothesis concerning the damming up of the Ohio by the glacial ice in the region of Cincinnati was an actual reality; that during the period of its continuance the principal tributaries of the Ohio had their valleys filled with sediment carried down and dumped into them by the mountain torrents and other streams which drained the area south from the glaciated region; that subsequently when the barrier disappeared, the rivers recut their channels through the silt deposits, probably by spasmodic lowering of the dam in such a manner as to leave the deposits in a series of more or less regular terraces which in favored localities subsequent erosion has failed to obliterate, though from steep slopes it has removed their every trace.

The elevation of this dam at Cincinnati as determined from the upper limit of the fifth Monongahela River terrace, would be somewhere between 1050 feet and 1075 feet above tide, or about 625 feet above low water there in the present Ohio.

THE EVIDENCE FOR EVOLUTION FOUND IN THE HISTORY OF EXTINCT MAMMALIA.

PROFESSOR E. D. COPE.

Abstract: Read in General Session, Monday, August 20th.

The speaker, in commencing, said that the subject of evolution divided itself naturally into two parts—first, the question of the fact of evolution, and secondly, the question of the mode and active cause of evolution. The fact of evolution was believed by a majority of the cultivators of biological sciences at the present time.

The doctrine of evolution, succinctly stated, means the doctrine of direct descent of organic species from pre-existent species in succession from an early

period in the world's history. That such has been the case is rendered certain by the variations of form and other characters which are so commonly met with in animals and plants, whose descent we can observe. To believe that species were originally created distinct requires that those varieties should also have been distinctly created, which we know not to have been the case. While we cannot observe these changes in fossil species, we frequently find variations in them of a character identical with those seen in living species: and we can properly infer that the origin of these varieties has been the same in both cases. The late discoveries of palæontology have disclosed a general system of relations of the extinct species, entirely accordant with the process of solution from simple to more complex forms of life. The constant discovery of new forms of life and even of new populations of animals and plants, demonstrates the imperfection of the geological record, and holds out the promise that we will sometime have a completed genealogy of all existing animals, including man.

The speaker referred to the two great phenomena of constancy and variation, which meet the student of biology upon every hand, and dwelt at some length particularly upon the subject of variation. After giving some instances of variability as observed in certain birds and animals, he said:

The amount or degree of difference is a graduated quantity, and passes insensibly from the lesser to the greater; that is from the varietal to the specific. Besides we find related species constant in one part of the world, to be variable in another; also that individuals can be distinguished into species in two regions each taken separately, but, when all are compared together, the definitions of species vanish. These facts confirm us in the lawfulness of the general induction that all species, no matter how constant they may appear to us now, have been at some other time and place as variable as the most variable ones known to us. Moreover, to suppose that new elements of form, color, etc., can be introduced by the operation of laws of development in one set of organisms and not in another, is to violate the very foundation of all practical and instructive reasoning. It is also equally certain that the structural characters in which we have genera, families and orders are variable in some parts of the system. This, then, is the primary evidence of the descent of existing types from pre-existent ones. Taken by itself, this evidence is not conclusive, but in connection with that derived from the observation of living specimens, is cumulative to a degree which satisfies the mind as to the general fact of evolution, and already explains much of its mode and manner.

The speaker went on to show that although the geological record of the fossil mammalia is imperfect, it has become unsafe to assert that connecting forms have not been found, and still more unsafe to assert that they will not be found.

As to whether any intermediate form connecting man with the lower animals has yet been found we cannot speak with certainty. The earliest preserved human skeletons often represent well developed men, while others are less well eveloped, as, for instance, the jaw found at Nanlette, Belgium, which is very

simian. Our greatest ignorance lies in the direction of the structure of higher extinct apes, whose teeth have been found, but of whose skulls we know nothing. But it is really of less than usual importance that such a form should be discovered (though I have no doubt it will be; for we have so often bridged wider gaps than that between homo and simia that the evidence may be regarded as sufficient. All that is necessary is to change the direction of the tendon which supports the first toe of the posterior foot, so that it shall become straight and not divergent from the other toes: to reduce a little the size of the canine teeth, and the space in front of the inferior canine, and the change from genus to genus is complete. The approximations already known render it probable that the change has already occurred.

The speaker here illustrated by a table upon the blackboard the characters which distinguish certain families of geological mammalia, together with the character and period of their changes. The changes were seen first in the limbs and feet, second in the teeth, third in the hair. The formations mentioned were all tertiary. The table showed that during this period the hoofed mammalia underwent general modifications of structure in many ways. The toes became less numerous and the feet larger; the ankle and wrist joints became more perfect; the teeth passed through a great number of stages from simple to complex, and the brain increased greatly in size and complexity. An examination of these changes, said the speaker, demonstrated that they were all of the nature of mechanical improvements for the accomplishment of work. Many evolutionists are content to leave the question at this point—the survival of the fittest. But this is not enough.

The Darwinians proper, he continued, have been willing to treat the variation of form, as a matter of course, and as taking place in all directions and ways. They have openly or tacitly avowed a doctrine of omnifarious variation. This mode of stating the case has met with adverse criticism within and without the ranks of the evolutionists. It is contrary to the so-called law of chances that such omnifarious variation should produce the exact adaptations so wonderfully displayed on every hand; and palœontology distinctly negatives any such supposition. Evolution had proceeded along lines of profitable variation; it is even probable that most variations have been profitable in some direction, and that the extinction of so many of the lines has been due to the fact that they have not been permanently, but only temporarily beneficial. In a word, "the origin of the fittest" has been adaptive in its direction, and for this there is only one explanation—*i. e.*, the action of mind. And it is altogether probable that this mind is to be found in the animal itself, and has acted as the director of its movements. If the movements have produced the structures under the influence of impacts, strains, etc., as I believe to be the case, and expect to see proved, the relation of mind to the development of types becomes clear, and explains the origin of the fittest.

On Saturday the 18th an excursion to Lake Minnetonka was tendered by the local committee, and about three hundred of the members availed themselves of the opportunity to visit this most lovely of western resorts. On arriving at Lake Park Hotel an excellent dinner was served, after which the whole party was taken upon the magnificent steamer, City of St. Louis, for an excursion of some thirty miles around the lake and among the islands, bays, straits, etc. This excursion will long be remembered as one of the pleasant features of the Minneapolis meeting.

On Monday afternoon, August 20th, another excursion was tendered; this time to St. Paul *via* Minnehaha Falls and Ft. Snelling. This also was highly enjoyable and terminated in a formal reception by the municipal officers and citizens of St. Paul and a grand dinner at the Metropolitan and Merchants' Hotels.

On Wednesday, the 22d, the Association adjourned. The next meeting will be held in Philadelphia, and the British Association, which meets in Montreal at the same time, will join it. Over $100,000 has already been subscribed in Philadelphia to meet expenses.

The following are the officers for 1884: President, Prof. J. P. Leslie, of Philadelphia; General Secretary, Dr. Alfred Springer, of Cincinnati; Assistant Secretary, E. S. Holden, Madison, Wis.; Treasurer, Wm. Lilly, Mauch Chunck, Pa.; Permanent Secretary, Prof. F. W. Putnam.

ASTRONOMY.

ASTRONOMICAL NOTES FOR SEPTEMBER, 1883.

W. W. ALEXANDER, KANSAS CITY, MO.

The Sun's apparent right ascension will increase only one hour and forty-five minutes during this month; this is a very small amount, the average being two hours. Its diameter is also increasing; on the 1st it is 31′ 46″ and on the 30th 16″ more. Equation of time, or the angular distance between the true and equatorial fictitious Sun, usually called the "mean Sun," will be on the 1st 6.86 sec., on the 30th 10 min. 01.1 sec. The sidereal time of Kansas City mean noon on the 1st will be 10 h. 42 min. 15.8 sec., on the 15th 11 h. 37 min. 27.6 sec., and on the 30th 12 h. 36 min. 35.9 sec.; daily change from noon to noon 3 min. 56.556 sec.

MERCURY.—The most favorable time to see this planet will be on the 10th, at this time it will attain its greatest elongation east of the Sun and will be visible in the evening for one hour and thirty minutes after sunset. It will set about 6° south of west, at the time of its elongation. The difficulties in the way of seeing this planet are numerous; but few persons have ever seen it. The amount of

light we receive at its maximum brilliancy equals that of a first magnitude star, but being always seen when near the horizon, it does not appear brighter than one of the second magnitude. During this month its south declination is rapidly increasing, also the apparent diameter. On the 24th it is moving in a direct line toward the earth.

VENUS.—This planet cannot be seen this month except by the aid of a good telescope. On the 20th at 5 o'clock P. M., she is in superior conjunction with the Sun and will pass very close to his northern limb; were it possible to measure the distance it would equal two-thirds of the apparent diameter of our Moon.

MARS.—This will be in right ascension 6 h. 23 min. to 7 h. 37 min., and will rise, in the morning about 1 o'clock, at a point 23° north of east. Its diameter is 6.2″ on the 1st and slowly increases. On the morning of the 20th it is in conjunction with Delta Geminorum and will pass 49′ north of the star. The Moon also pays him a visit on the 24th. He is too far from the earth for telescopic study; with the best instruments his satellites cannot be seen.

JUPITER.—The giant planet of our system is rapidly gaining a conspicuous position as morning star, rising about four hours before the Sun. On the 1st it is in the western edge of the constellation Cancer and will remain in this constellation during the entire month. Its apparent right ascension is 7 h. 50 min. to 8 h. 11 min., declination north 21° and slowly decreasing. This massive planet is about 13,000 times larger than the earth. His mean distance from the Sun is 480,000,000 of miles; length of his year, or time of revolution round the Sun, is fifty days less than twelve years. It can be easily recognized by his brilliant white light, with which he outshines every other planet or star in the eastern sky, except the Sun and Moon. There is no other object in our system that has been the subject of more careful examination than this same planet. There are no really permanent markings on his disk, therefore a map of Jupiter is impossible; but his surface always presents a very diversified appearance. The first telescopic observers described light and dark belts as extending across it; until quite recently, it has been customary to describe these belts as two in number, one north of the Equator, and one south of it; usually they are seen as dark bands on the bright disk of the planet. Huyghens represents them as brighter than the rest of the disk. As telescopic power increased, it was found that the so-called bands were of a far more complex structure than supposed, and presented more of a cloud-like form; these forms change so rapidly that the face of the planet hardly ever presents the same appearance on two successive nights. In addition to the ever-changing features of the disk, it is also attended by four moons, which as they course round the planet in their orbits, lend additional interest to the picturesque phenomena presented by this miniature representative of our system. As the plane of the orbits of the moons lie in the same direction with the Equator, they must, at every round they make in their orbits, get eclipsed by entering the shadow of Jupiter, occultated by passing behind the planet and appear as light and dark spots on its face when they are between the Earth and its disk, also the Sun when they make eclipses the same as our Moon does on the Earth. The

most interesting days to watch the satellites will be the 3d, 10th, 11th, 15th, 19th and 27th.

SATURN.—On the 1st Saturn is in right ascension 4 h. 33 min., and only increases two minutes during the month. It will rise about 10 o'clock in the evening and after that time will be visible all night. The apparent diameter is increasing. The southern surface of its rings has opened out full to the view, the Earth having nearly attained its greatest elevation above the ring plane—25° 24′. This is the sixth planet, in order of distance, from the Sun, and the most remarkable; it is next in order to Jupiter and most remote from the Earth of any that are visible to the naked eye. It may easily be distinguished from the fixed stars by its pale, feeble and steady light. Situated 890,000,000 of miles from the Sun, it revolves round it in twenty-nine years one hundred and sixty-seven days, therefore its apparent motion among the stars is quite slow, being only 12° a year. Saturn, besides being attended by eight moons, is surrounded by two large co-eccentric rings which are separated from each other and also from the planet. The matter of which these rings are composed is, in all probability, fluid or even gaseous, and they are observed to cast a strong shadow upon the planet itself. Saturn is about 1,000 times larger than the Earth. The axis is inclined to that of its orbit 28°, and as the rings are in the plane of the Equator, the axis of the rings has the same inclination, hence they must present to the inhabitants of the planet a most magnificent spectacle. They appear like vast arches or semicircles of light, extending from the eastern to the western horizon. At the Equator the outer ring is not visible, being hidden from view by the inner ring; but in about 45° of latitude, both can be seen and present a magnificent appearance. During the day-time, they appear dim like a white cloud, but as the Sun goes down their brightness increases, while the shadow of the planet is seen to come up on the eastern limb of the ring and gradually rise to the zenith, when it passes down and disappears in the western horizon at the rising of the Sun. The rays of the Sun always fall obliquely upon the rings, as the Sun is never seen more than 30° above their horizon, while at other times their edge only is presented to the Sun. These rings appear rough and of unequal thickness and width, and it has been demonstrated that they could not maintain their stability of rotation if they were in all parts of equal thickness and density, as the smallest disturbance would destroy their equilibrium, which would continue to increase until at last they would be precipitated upon the planet. This planet has also eight moons, or satellites, but they are only seen with a very good telescope. Their orbits, with the exception of the seventh, are nearly in the plane of the rings.

URANUS—Will be in conjunction with the Sun on the 16th, hence it is impossible to see it this month.

NEPTUNE.—Planet Neptune is in right ascension 3 h. 16 min. on the 1st, and 1 min. less on the last of the month. About noon on the 20th it will be occultated by the Moon. It is not visible to the naked eye.

THE MOON.—On the evening of the 3d, the Moon will be seen 5° south of west for about one hour after sunset. On the 4th at 7 P. M. it will occultate 58

Virginis, a star of the sixth magnitude. On the 6th, Alpha 1 and Alpha 2, Librae, the first a star of the sixth, and the second, a star of the second magnitude; both stars will disappear behind the Moon before it is dark enough to see them; their reappearance can be seen 6 h. 32 min. and 6 h. 57 min. P. M. On the 13th a star of fourth magnitude, in the constellation Aquarii, is occultated at 11 h. 13 min. P. M. On the 16th, two stars 21 and 25 Piscium, both of the sixth magnitude; on the 17th, E Piscium of the fourth magnitude; on the 18th, 54 Ceti and B A. C. 609, both of the sixth magnitude; on the 19th, Gama Arietis, fifth magnitude; on the 21st, B. A. C. 1468 and 2 Tauri, sixth magnitude; on the 25th A. 1 and A. 2 Cancri, both of the sixth magnitude; on the 26th, W. Leonis, fifth magnitude. All of the above accultations are visible at Kansas City, besides these it will make ninety-one occultations visible in different parts of the earth. It will also pass Saturn on the 21st, Mars on the 24th, Jupiter on the 25th, Uranus on the 29th and Venus on 30th.

SUN AND PLANETS FOR SEPTEMBER, 1883.

W. DAWSON, SPICELAND, IND.

The Sun's increase of right ascension, caused by the Earth's motion around the Sun, brings it to R. A. 10h. 42m. on September 1st, and 12h. 26m. on the 30th. The show of solar spots thus far (11th) has been very small compared with last month. But two or three good sized spots and considerable faculæ near the east edge, I think indicate an increase spot-producing activity.

Mercury is evening star this month. It arrives at greatest eastern elongation on the 10th. For a few evenings before and after this date Mercury may be seen with naked eye a little south of west in the waning twilight. Spica, the bright star in Virgo, will be a few degrees above, and southward, of the planet. Venus is near the Sun—coming to superior conjunction the 20th; after which it will be an evening star.

Mars is among the prominent stars in central Gemini—southerly from Castor and Pollux toward Procyon. Jupiter is morning star and very prominent considerably north of east. It rises about 2 A. M. on the 1st, and soon after midnight on the 30th. Its moons may be seen easily with a spy-glass one and a half inch diameter. Saturn is high up in the morning sky; souths a little before 6 A. M. on the 1st, and about 4 A. M. on the 30th. It is about 5° nearly north of Aldebaran, and changes place among the stars but *very little* during the month. Uranus will be in conjunction with the Sun on the 16th. Neptune is in a blank region in Taurus nearly 10° southwest of the Pleiades.

METEOROLOGY.

REPORT FROM OBSERVATIONS TAKEN AT CENTRAL STATION, WASHBURN COLLEGE, TOPEKA, KANSAS.

BY PROF. J. T. LOVEWELL, DIRECTOR.

The usual summary by decades is given below.

TEMPERATURE OF THE AIR.	July 20th to 30th.	Aug. 1st to 10th.	Aug. 10th to 20th.	Mean.
MIN. AND MAX. AVERAGES.				
Min	. .	. .	. .	. .
Max	. .	. .	. .	. .
Min. and Max	. .	. .	. .	. .
Range	. .	. .	. .	. .
TRI-DAILY OBSERVATIONS.				
7 a. m.	71 3	66.2	69.3	68.9
2 p. m.	83 5	81.2	88.0	84.2
9 p. m.	72.0	67.0	72.5	70.5
Mean	74.7	70.3	75.5	73.5
RELATIVE HUMIDITY.				
7 a. m.	.89	.90	.90	.90
2 p. m.	.68	.60	.59	.62
9 p. m.	.84	.88	.87	.86
Mean	.80	.79	.79	.79
PRESSURE AS OBSERVED.				
7 a. m.	29.095	29.175	29.075	29.115
2 p. m.	29.084	29.180	29.055	29.106
9 p. m.	29.085	29.160	29.060	29.102
Mean	29 088	29 171	29.065	29.108
MILES PER HOUR OF WIND.				
7 a. m.	9.5	4.2	6.3	6.7
2 p. m.	12.8	8.3	8.8	9.9
9 p. m.	7.1	4.3	5.7	5 7
Total miles	2863	1282	1515	5660
CLOUDING BY TENTHS.				
7 a. m.	4 8	6.3	4.2	5.1
2 p. m.	5.2	5.7	4.0	4.9
9 p. m.	4.8	2.8	5.0	4.2
RAIN.				
Inches	2.87	.97	3.20	7.04

There was a heavy wind the night of the 19th, 0:35 A. M., the wind reaching the velocity of 70 miles per hour.

The prevailing winds have been southwest, and have traveled a comparatively small number of miles.

Highest barometric pressure was July 28th, 29.310, reduced 30.245 inches; the lowest barometric pressure was on August 19th, 28.92, reduced 29.817 inches.

Highest temperature 95° on July 23d; the lowest temperature 57° on August 20th.

BOOK NOTICES.

A VISIT TO CEYLON: By Ernst Haeckel, translated by Clara Bell; 12mo. pp. 337. S. E. Cassino & Co., Boston, 1883. For sale by M. H. Dickinson & Co. $2.50.

To those persons who have only heard of Professor Haeckel as a biologist and an anthropologist, or as an evolutionist of the most pronounced type, or as a writer of huge volumes on microscopic objects, this book will prove a great surprise. It is written in an easy, sprightly manner, bordering upon the enthusiastic and contains little more of technical matter than if written by De Amicis or any other book-maker. At the same time his observations are fresh, critical, and accurate. Evidently he expected to achieve important results from his explorations in the tropical seas and forests of India for he took with him no less than sixteen trunks and cases of luggage. "Two of these were filled with books—none but the most necessary scientific works; two others contained a microscope and instruments for observations in physics and the study of anatomy. In two other cases I had apparatus for collecting materials and for preserving specimens; soldered tins, containing different kinds of spirit and other antiseptic fluids, carbolic acid, arsenic and the like. Then two cases contained nothing but glass vials—of these I had some thousands—and two more were packed with nets and appliances of every kind for snaring and catching the prey; trawls and dredging-nets for raking the bottom of the sea, sweeping and landing-nets for skimming the surface. A photographic apparatus had a chest to itself, and one was filled with materials for oil and water-color painting, drawing and writing. Another was packed with a nest of forty tin cases, one inside of another. Then another contained ammunition for my double-barreled gun—a thousand cartridges with different sizes of shot. Finally, in two tin trunks I had clothes and linen to last me during my six months' wanderings."

This gives an idea of what preparation is made nowadays for a scientific excursion of six months by a single observer. It does not appear, however, that his explorations were rewarded by any very remarkable discoveries. The field had been pretty fully explored by Hooker and Wallace in the Eastern Hemisphere and by Darwin and Humboldt in the Western, years before. However, his descriptions of places visited are admirably done and no more attractive work has been put forth. To Bombay alone thirty one pages are devoted, while to Columbo, "Whist Bungalo," Kaduwella, Peradenia, etc., are given from ten to twenty each. No place is slighted and all are faithfully portrayed. The scientific spirit peeps out in all directions, botany, zoölogy, chemistry, anatomy, meteor-

ology, all appear by turns, not technically, however, but naturally, as the necessary concomitants of a scholar's observation, *en passant.* Not a trace of the dogmatism which appertains to Haeckel's character as an upholder of his biological theories appear anywhere in the volume, and we can recommend it to any reader who desires simply facts set forth in a glowing and attractive style.

The details of printing, binding, etc., have been carefully attended to by the publishers with the result of producing a very handsome book.

RECOLLECTIONS OF MY YOUTH: By Ernest Renan; translated by C. B. Pitman. 12mo. pp. 355. G. P. Putnam's Sons, 1883. For sale by M. H. Dickinson, $1.00.

This is another book on common things by a distinguished author whose name is usually connected with philosophical and religious subjects. It is intended somewhat as a memoir of M. Renan's earlier life, though by no means as an autobiography. At the same time it is made a convenient and, perhaps rather unofficial, means of expressing certain opinions and shades of thought not conveyed in his more pretentious works. It may also be regarded as an index or indicator of his mental growth and development under different environments.

The titles of the chapters are as follows: The Flax-Crusher, Prayer on the Acropolis, St. Renan, My Uncle Pierre, Good Master Systeme, Little Noemi, The Petty Seminary of St. Nicholas Du Chardonnet, The Issy Seminary, The St. Sulpice Seminary, First Steps outside St. Sulpice, Appendix.

OTHER PUBLICATIONS RECEIVED.

Work of the U. S. Signal Service. Report of Mr. W. M. Beebe, Relief Expedition to Lady Franklin Bay, Grinnell Land. Lieutenant Joseph S. Powell. Relief Expedition to Point Barrow, Alaska. Lieutenant O. Henry Ray, Work at Point Barrow, Alaska, from September 16, 1881, to August 25, 1882. Miscellaneous Papers on Anthropology, prepared under direction of Prof. Otis T. Mason, from Smithsonian Report of 1881. Norman Constables in America, by Herbert B. Adams, Ph. D., June, 1883. Paper read before Loyal Legion on Gen'l Wm. Haines Lytle, by Dr. And. C. Kemper, June 16, 1883. The Pulpit —The Treasury, J. Sanderson, D. D. Observations on Rocky Mountain Locust and Chinch Bug, 1883, Prof. C. V. Riley. Inaugural Address of President C. O. Thompson, delivered at opening of Rose Polytechnic Institute, March 7, 1880. Special Report on Industrial Education, prepared by the U. S. Bureau of Education, 1883. Four Years Term in Rotation in Office, by Frederic W. Whitridge, June, 1883. Gunnison, Colorado's Bonanza County, by John K. Hallowell, 1883. *The Western Jurist*, a monthly Law Magazine, June, 1883. Crop Report of Kansas State Board of Agriculture, June 30, 1883. Proceedings Boston Society of Natural Science, 1882. Bulletin of Torrey's Botanical Club,

1883. Seventh Annual Report of Railroad Commissioners for State of Missouri, 1881 and Bulletin of Geographical Society, 1882. Notes on Literature of Explosives by Prof. Chas. E. Monroe, U. S. N. A., 1883. Proceedings Royal Geographical Society, 1883. Scholar and Man, by M. F. Force, address before Literary Societies of Marietta College. Catalogue of Missouri State University, 1882–3. *Psyche*—Entomological Society—1883. Fuel for the Army, 1882, Gen'l M. C. Meigs. Notes on Value of Carbo Hydrates as Food and Physiology of Starch-Digestion, address by Lloyd Tevis, of California, 1881. A History of the People of the U. S., by John B. McMaster. *Railway Review*, June 30, 1883. Tours in England, Ireland and Scotland, Where to Go and What to See in the British Isles. Fourth Report of Executive Committee, and Second Report of Committee on American School of Classical Studies, at Athens, 1883. Ninety-Fifth Anniversary of Settlement at Marietta, Ohio, address by Hon. Geo. B. Loring, 1883. Bureau of Education Circular on Co-Education of Sexes in Public Schools of U. S., 1883. Kansas—The Golden Belt Lands, 1883, B. Mac Allister. Political Economy, a Science Based on Assumptions, by William D. Kelly, 1882. How Protection Affects the Farmer, by Thomas D. Hudley, 1882. *Magazine of American History*, edited by Mrs. M. J. Lamb, 1883. Proceedings of Fifth Grand Annual Communication of Grand Lodge of New Mexico, 1882. *Christian Quarterly Review*, edited by E. W. Herndon, A. M., M. D., 1883. Bulletin Philosophical Society of Washington, Containing Minutes from 203 to 226 Meeting, 1883. Catalogue of Marietta College, 1835 to 1882, and Annual Catalogue 1882–3. Alumni Memorial of Marietta College. Memorial of John Cotton, Caleb Emerson, John Mills, A. T. Nye, Wm. R. Putnam, Samuel Shipman, B. B. Gaylord, E. B. Andrews, B. D. Fearing, D. W. Washburn. Report on Agricultural College Lands Lately Sold, by G. C. Swallow, LL.D., 1880–1. The Hog, address before American Agricultural Association at Chicago, 1882, by F. D. Coburn. Footprints of British Lion, 1882.

SCIENTIFIC MISCELLANY.

SCIENTIFIC NOTES.

S. A. MAXWELL.

I. On May 5, 1880, Mrs. F. M. Harrison, of Union Grove, Whiteside Co., Illinois, found a specimen of smooth lung-wort, *Mertensia Virginica*, the corolla of which was of pure white. In all other respects the plant was just like the one improperly called the "blue-bell," except that the leaves and stem seemed to be a little lighter colored. It was probably a freak of nature—an albino of its species.

II. On a certain occasion, having successfully performed the well-known experiment of producing jets of flame in the bottom of a tube of water containing bits of phosphorus and potash chlorate, I concluded out of curiosity to add to the mixture a few scales of iodine. Having done this I placed the tube over the spirit lamp, when there occurred quite a violent explosion—a part of the water in the tube being thrown out, and at the bottom of the tube there remained a spongy mass, brown in color, and several times greater in bulk than the aggregate of the three solids originally put into the tube. The query is: what was the chemical reaction in this experiment? And again, since iodine and phosphorus readily burn in air if in contact, did the presence of a small quantity of sulphuric acid help to produce the result?

I would like very much to have answers to these queries through the REVIEW or otherwise.

III. A barometer, much more reliable than the "storm-glass" which has had such extensive sale during the past few years, may be made as follows: Let one end of a glass tube, one half inch in diameter and about twenty-eight inches long, be corked air-tight, then fill the tube about four-fifths full of water, insert the open end in a large mouthed bottle or a glass fruit-jar. On a piece of paper mark a scale in inches and tenths and attach it to the outside of the tube, having the middle of the scale even with the top of the water in the tube. The scale need not be over four inches in length as that will more than cover the rise and fall that will be observed. The instrument is now complete, but correction for temperature must be made for each observation, as the height of the column of water varies much more from changes in temperature than from atmospheric pressure. With the instrument which I have constructed on this plan the depression of the column for each degree of increase of temperature is .036 inches. Let the following, taken from two observations on the 20th of last July, serve to show correction for temperature:

Thermometer 2 P. M. . . . . 78°
Thermometer 9 P. M. . . . . 72°
Water Barometer 2 P. M . . . . . 12.45 inches.
Water Barometer 9 P. M . . . . . 12.55 inches.

78°—72°=6°. .036×6=.216, say .22.
12.45+.22=12.67. 12.67—12.55=.12.

It may be understood from this that had there been no change in the atmospheric pressure the barometer reading for the latter observation would have been 12.67, but since it stood 12.55 it indicated a depression of .12 inches on the column of water.

Having compared the workings of this simple instrument with a number of standard ones, I am satisfied that it is worth the trouble of construction. The material would cost but twenty-five cents, and the making would require less than as many minutes. The tube should pass through the cork but of course the bottle should not be corked air-tight. After the water has remained in the bottle

several days it may be changed without removing the tube, by turning several pints of water into or upon the bottle so as to cause an overflow of most of that first contained. Repeating this operation weekly will keep the water quite pure. The more nearly filled the tube is with water the less will be the variation due to temperature, for it is mainly the expansion of the air in the upper part of the tube that depresses the column of water beneath. The change due to atmospheric pressure is also more marked when the tube is nearly full, since the length of the water-column is increased.

Captain Geo. H. Fay, of Morrison, Ill., uses one of these instruments, and by having the tube very nearly filled with water thereby dispenses with the trouble of making corrections for temperature.

MORRISON, ILL., July 21, 1883.

PROFESSOR ESPY.

Few are aware of the origin of the present efficient Signal Service, nor of the debt of gratitude the whole country owes to the late Prof. James P. Espy. His rise to prominence in the scientific world, as related by Capt. Samuel Erseyis, of Philadelphia, who was one of his earliest friends, is one of remarkable interest.

When about ten years of age, Espy's father died, and mother and son tramped from their home near Harrisburg out to Ohio. The boy was put at farm labor, at which he served until seventeen years of age, for the meager pay of fifty bushels of corn a year. A signal incident marks the commencement of his career. Henry Clay was just then rising to fame, and young Espy found himself one afternoon within sound of the silvery voice which was yet to captivate its tens of thousands.

Espy was entranced by its witchery and followed the American Cicero as a needle the lodestone. He got near enough to Mr. Clay to have some one mortify him by pointing him out with, "Here, Mr. Clay, here's one of your admirers He's seventeen years of age, and can't read." Mr. Clay laid his hand affectionately upon the lad's head and said: "Come, my lad, let us see if we can find a book store hereabout." A book store was found. Mr. Clay purchased a copy of Noah Webster's spelling book; opened the book at the alphabet, and, pointing to the first letter with a long index finger, said: "This is the letter A. Do you understand? Yes! Well, there are twenty-five more of them. You must learn the rest, and when you have learned them it will not take you long to learn to read."

Ten years after this time Espy was here in Philadelphia, engaged in teaching school. John Troutwine, well known to many citizens, was one of Espy's pupils. At that time the Franklin Istitute had a high school connected with the institution. Walter R. Johnston was the first professor; his specialty was chemistry. Espy was the second, and taught mathematics. He was hungry for knowledge, and the motto prefixed to his first work, "The Philosophy of Storms,"

published in 1841, indicates the man: *Felix qui potuit rerum cognoscere causas.* There was no great "Unabridged" at that time, and Espy was always unhappy until he found out the meaning of things. He therefore applied himself to the study of Greek, and soon became master of that language. Says Capt. Erseyis: "Espy could not write a ten-line advertisement in good and graceful English; but he was accustomed to note down his thoughts in Greek and afterwards would translate them into his vernacular. He corresponded with the great Arago, in Greek, as he did with other learned men in Europe"

He was also a student of nature. Long before he knew why, young Espy began to study the mystery of the slowly moving clouds as they gathered their forces together in elemental warfare; but he found he could come no nearer to a true answer to his question than did the prophet from the storm that roared around the cave in Horeb. Failure, however, did not deter him. If the storm would not call back in answer to him from the clouds, he could reach up to them by means of Franklin's messenger, the kite; and when the strongest cords were broken in his adventurous attempts, leaving only blistered and lacerated hands, he bound his emissary by means of strong wire reeled on a windlass.

Espy was a most patient collector of data, and facts were the basis and support of all his theories. He was patiently industrious in acquiring facts by observation and comparative experiment. In hundreds of fields, then vacant, now covered with houses, in and around Philadelphia, he studied the laws which govern the winds, the causes of the storms, and determined upon those artificial means by which rain may be produced. But the time was not yet ready for him. When he went to Washington, asking of Congress a paltry $5,000 a year for five years, that he might be enabled to extend his experiments and enlist the aid of others over a larger area than Philadelphia's back lots, he was met with jibes and ridicule. Senator Preston, of South Carolina, said Espy was a madman, too dangerous to be at large, and the Senator would vote a special appropriation for a prison in which to confine him. Espy was in the Senate gallery at the time. Wounded to the quick, he came down and found his way back to Philadelphia.

Gathering heart once more, he went to New York and put a small advertisement in the *Evening Post* announcing a lecture at Clinton Hall, in which he would show how rain could be produced. Espy expected to meet a crowd of 1,000 people. The audience was a Miltonic one, "fit though few," for hardly a score of persons were present. Among them were William Cullen Bryant, and, as Espy afterwards found, his life-long friend, adviser, pupil and lover, Capt. Samuel Erseyis. Espy went through his lecture; then submitted to a running fire of question, and, these answered, frankly confessed his disappointment. Clinton Hall had cost him $18. There was a hotel bill to be paid, and he had but $5 in the world with which to pay this vast and impossible sum. He had in stock five sets of lectures, price, $5 a set, that was all.

There was a pause of a moment or two after which Capt. Erseyis promptly subscribed $25 for the course, put the money into Espy's hands, and was immediately followed by Bryant and nearly all of those present, until his pockets were

filled and Espy himself was as overcome as a child. Before New York would let him go he delivered nine courses of lectures; went thence to Boston, where he gave six, and then made the tour of the Union and $25,000 besides.

Soon afterwards he sailed for Europe. Not long after reaching Liverpool, January 6, 1839, a great storm occurred. He went to Lloyds, consulted the newspapers as they arrived noted the direction of the wind as given at the different places, and from these data constructed the first great storm-map ever prepared, with the hour-points marked. Every line and curve and point exemplified his theory. He was at no loss now for audiences. He appeared before the British Association of Scientists, at London, at which Sir John Herschel was present, an interested auditor. He crossed the Channel to Paris, and the Academy of Sciences appointed a committee, composed of the illustrious Arago, with whom were joined Messrs. Pouillet and Babinet, "to report upon the observations and theory of Mr. Espy, which have for their object the aerial meteors, known by the names of storms, water-spouts, and tornadoes, which occur in the vicinity of the Gulf of Mexico; storms, however, which are produced in every part of the globe when a few given conditions concur in one place."

The length of the Arago report indicates the strong hold which Espy's startling and conclusive array of facts had made upon the minds of the members of the Academy, and also evinces the care with which the committee studied the subject from its scientific standpoint. The effect of the report, when it reached Washington, was not much different from that which followed, afterwards, the announcement of Morse's first transmitted message over the wire from Washington to Baltimore.

In due time Prof. Espy returned to the capital of his own country, and one of the first public men he encountered was Senator Preston. They met on Pennsylvania Avenue. Towards the conclusion of their report, M. Arago's committee had expressed the hope that the Government of the United States would place Mr. Espy in a position to continue his important investigations and complete his remarkable theory by means of all the observations and all the experiments which even the deductions of this theory may suggest in a vast country, the home, as it were, of the aerial meteors, storms, water-spouts and tornadoes. Senator Preston was prompt to apologize for she mistake he had made when his language drove Espy from the Senate gallery, and he was as profuse in his promise to help the storm-king onward in the spirit of the French report. It is a matter of history that he did so; that Espy got his $25,000, and that to him we owe the first step in the formation of the present Signal Service.—*Philadelphia Press.*

BOTTLED SUNSHINE.

T. BERRY SMITH.

The coal we burn, formed in the ages distant,
Is bottled sunshine, and to prove it so,
We'll hire Fancy and with her as assistant
Back up the geologic stream we'll row.

That creature there amid the dark old forest,
Nipping the twigs and breaking down the trees
Is nothing but a huge old Deinosaurus
Feeding himself and doing as he please.

Along yon beach you see a creature striding,
Leaving his tracks three feet apart or more—
Well, that's a bird: (we follow Marsh deciding),
Lestornis counts his dentals by the score.

Still on we go, the vista ever changing;
Lo! Pterodactyls wing their heavy flight,
While all around us in the waters ranging
The Ichthyosaurs the Plesiosaurians bite.

And now we've passed the wondrous line dividing
The Mesozoic from the Palæozoic time—
Have come to where Amphibians huge are sliding,
And crawling round in marshes full of grime.

And now, my friend, we cannot go much longer:
Carbonic acid gas so fills the air,
It chokes a man; the sun's heat too is stronger;
Aquatic life alone is everywhere.

Plants Cryptogamic flourish all around us—
Unnumbered fronds of Arboraceous ferns,
And Lycopods whose hugeness does astound us—
Catching the sunshine which so fiercely burns.

These plants receive the sunshine like an awning
And drink it in with much carbonic gas,
And then store up——— Aha! the truth is dawning,
And I can see you're "catching" on at last.

And so 'tis true that coal is sunshine bottled
And stored away the earth's old crust below;
Man burns the coal—the sunshine is unthrottled
And fills the world with all its ancient glow.

GLASGOW, MO.

THE WORK OF THE KANSAS FISH COMMISSION.

W. S. GILE.

VENANGO, KAS., July, 30, 1883.

For the information of your readers in reply to queries as to what my department is doing, I will say that since assuming the office of State Fish Commissioner, last spring, I have planted 30,000 speckled trout in spring creeks that have gravelly beds and an uniform flow of water, and where I have substantial reasons for believing that the temperature of the water will not rise above 55° F. I have also planted at Junction City in the Smoky Hill River 350,000 shad, received from Prof. Baird of the U. S. Fish Commission. My other work has been in making examination of the streams of the State for a two-fold purpose—first, to determine from a personal examination what varieties I had better select in order to have them adapted to the stream and climate; secondly, to see what obstructions had been placed in them that would prevent the passage of fish. These objects I have accomplished. Owners of dams have promised me that during the season they will construct fish-ways, and I have given them assurance that on this promise I will stock the streams with such food fish as I believe will stay, and if the people will not destroy them it will only be a few years before the streams of the State will be *alive* with black bass, crappie, channel catfish, pike and wall-eyed pike.

As soon as the Mississippi is low enough I shall commence the catch. My arrangements for boats, cages, tanks, seins, nets, and all the apparatus necessary to work the whole matter fully and thoroughly are made, and nothing will defeat them but the elements. I may add one or two other varieties to the list. In this, however, I shall be governed by my judgment after we commence the catch. When the river gets low enough at Quincy to begin the catch, I shall want from among your fishermen who are used to caring for live fish two or three *good, trusty* men to act as messengers and take care of the fish while in transit, and plant them in accordance with my *written directions*. I shall probably begin the distribution of carp in October, and deliver from Kansas City.—*Live Stock Indicator.*

SPIRITUS MUNDI.

E. R. KNOWLES.

Stat Ætherium infinitum
Tempore et spatio,
Et æterno per naturam
Mundi instiratio.

Totum in uno alligantem,
Vim invictam mysticam,
Et materiam regentem,
Sentimus perpetuam,

MONEY: ITS ORIGIN AND HISTORY.

H. A. HAGEN.

All nations, on emerging from a state of barbarism, have adopted, without any mutual agreement, the precious metals, gold and silver, as a medium of exchange and standard of value. Certain pieces or coins, the definite fineness and weight of which are denoted by a familiar stamp, thereby became money. As a fixed measure of exchangeable value lies beyond the bounds of possibility, so that of the precious metals is subjected to variation. To ascertain the proportion in which the exchangeable value of money may have been altered is an inquiry of very difficult nature, demanding great sagacity, diligence and information.

The changes of the value of gold and silver during five centuries from 1320 to 1820 are the subject of the memoirs of two students of the late Prof. Carl Hagen. Both memoirs are still unpublished. As I am not able to find investigations of a similar extent, I have used the results. A large number of other details is taken from papers of my father.

Two capitals of exactly the same amount—one in gold, the other in silver—are supposed to have been invested in 1400. The change of the value of the capitals was as follows: During the fifteenth century the gold rose at first quicker, later the silver followed, so that after seventy-five years both capitals had again an equal value. But against 100 per cent in 1400 they represented 166 per cent in 1475. Both rose farther, and the capital in gold reached the highest point ever seen, viz: 175 per cent, shortly before the end of the century.

During the sixteenth century, in consequence of precious metals imported to Europe after the discovery of America, the gold and the silver—the latter had reached its highest points in 1510 with 215 per cent—were declining in such

a measure that both capitals in 1548 were again of equal value, but both only worth 85 per cent of their value in 1400. From this time, and during the seventeenth century, gold and silver were both declining at a nearly equal rate, the silver somewhat faster. Both reached in 1660, in the same year, what is very remarkably the lowest point. The capital in gold had then only 44 per cent, the capital in silver 37 per cent of its original value.

During the eighteenth century both rose again slowly, and were again of equal value in 1750. Again declining, they reached the formerly quoted lowest point in the beginning of the nineteenth century.

During those 400 years both metals rose and fell about in the same proportion, except after the discovery of America. During those 400 years the value of gold was changed to four times less and of silver to six times less than at the time of their value in 1500. The remarkable fact that both capitals were only once in each century of equal value is the best proof against the admissibility of bi-metalism.

The continuous rise of the value of gold and silver during the fifteenth century was apparently not the consequence of a declining production of the mines in Europe and Asia—which certainly is nowhere proved by facts—but only the consequence of the progress of trade and manufacture and the accumulation of wealth of the nations. There were relatively few wars during this time, and the advancing abolition of old feudal prerogatives kept pace with the consolidation of more natural and healthier forms of government. Agriculture, industry and trade were flourishing, and the increasing wealth was followed by a larger demand for costly ornaments and vessels of precious metals.

The news of immense treasures of gold brought over to Europe by the Spaniards from the newly discovered America checked suddenly the advance of the value of gold to a remarkable degree. The news spread through the world in the quickest possible manner, and was of course largely exaggerated. According to Humboldt's statement, the gold imported from America from 1494 to 1540 did not exceed $25,000,000, or only about $500,000 for every year.

Therefore the supposition of the inexhaustible wealth of America caused the sinking of its value rather than the really imported amount of gold. The subsequent religious troubles, the change of the old tradeway to India by the discovery of a more convenient one around the Cape of Good Hope, and the unsafe condition of the governments combined, together with disastrous wars, made the nations at first less rich, later poorer, and diminished the demand for the precious metals. The value of gold, which was twelve and a third times higher than that of silver in 1400, declined directly after the discovery of America to ten times, and in the beginning of the sixteenth century to less than eight times. When the Spaniards found no more gold to appropriate in America, silver was brought over, and the discovery of the rich Mexican mines was sufficient to bring down also the silver value, and to enable in this manner the precious metals to reach again the same standard of value. The amount of silver imported from America has been as much exaggerated as formerly that of gold. The silver imported did not exceed

for twenty years about $12,000,000. Therefore the unexampled decline of silver—a rent worth $1,000 in 1500, was worth only $305 in 1568—could not have been alone the consequence of the increased amount of silver, but probably more the diminished demand. The heretofore flourishing trade of Venice and of the Hansa was rapidly declining.

The growing disturbances culminated in long and disastrous wars and destroyed the former wealth of the nations.

At the end of the seventeenth century the returns of the rich mines in Brazil began to come to Europe. Humboldt has calculated that all the silver brought from America to Europe during the 300 years followed its discovery, joined together, would form a solid ball of sixty-three feet in diameter, and would represent together with the gold somewhat more than $2,133,000,000.

By degrees the mines of the old world gave also more important returns. Konigsberg, in Norway, which was believed to be exhausted, and was very near being sold for a small sum, produced large amounts of silver, among them nuggets of pure silver of 560 ounces weight, and continued to be productive. I can not omit to state here that the shores of New England are very similar to those of Sweden and Norway. Going from Boston to Salem you are reminded strongly of the shore of North Sweden, and the shores of Maine remind you also of those of Norway and its fiords. The rocks are similar, and the presumption of similar veins of pure silver, just as in Konigsberg, at a depth of 1,200 feet, is by no means improbable.

The mines in Russia, in the Ural and in Siberia, did not return much gold to 1814. In that year large quantities of gold were discovereed in the alluvium, similar to the formation in California, and in the Ural; in 1839 in the Kolywan district, and in 1836 near the Lake Baikal. Those layers produced, in twenty-nine years ending with 1847, more than $160,000,000.

It was to be supposed, after the precedent in the sixteenth century, that so sudden and large an increase of the amount of gold should be followed by a sudden decline of its value and in its relation to silver. Neither advanced; on the contrary, the proportion of gold to silver rose from 15.2 to 15.6 in 1823. The suggestion that this may have been the consequence of the decline of silver is refuted by the price of grain varying during this time only a very small fraction of a mark. The discovery of gold in California and silver in Nevada, and the immense return of all mines in the United States, are so well known that it would be bringing coals to Newcastle to speak about them here.

I may only remark that the first quotation of the gold returns to Congress, to July, 1849, amounted to $5,500,000, which is only one-third of the amount produced in Russia in 1847. The fact that gold had not declined in consequence of this immense production justified the presumption that even the new discovery would not seriously affect its value. Before the discovery of California Humboldt had stated that all known mines produced, of precious metals, every year, about $67,000,000. According to the last United States census, now $182,000,000 are produced. I may add only, that the statement of the Director of th

United States Mint gives the total yield to the close of June 30, 1882, of all mines of the different States and Territories as 1,109,000,000 of gold, the half of it from California, and 197,000,000 silver, one-half of it from Nevada.
from Nevada.

The production of the year 1880 represents five ordinary car-loads of gold, and a train of 109 freight cars of the usual capacity to transport the silver would be needed.

The question, How much of the precious metals is now in existence? has been answered by various quotations, without warranted proofs. They may be right or not.

Much more confidence is to be given to the statement that on November 6, 1882, the banks of England, France, Germany, and the United States Treasury alone contained $487,000,000 in gold; and it is obvious that this enormous amount is only a fraction—probably a large one—of the gold actually possessed by all the banks of the world. To this we have to add the enormous amount in circulation, and all the silver. But this is by no means all. In a large part of the world, small capitals earned by farmers, workmen and citizens are laid aside for emergency, often hidden somewhere, and represent by their number, doubtless an enormous large sum of money; the more so as it is the custom to keep such small capitals in specie. It probably will not happen again, as Archenholz tells us in his description of England in the last century, that a farmer presented to the Bank of England a £10,000 note, asking for an advance on it. Refusing to have the note paid, and when asked why he refused it, he answered candidly that he possessed for years this and a twin note of the same amount, and that he did not like to part with them.

The unexpected quick payment of the enormous war indemnity by France to Germany has generally been explained by the unusually large number of small capitals which were freely offered by the patriotic and noble feeling of the inhabitants. The amount of gold and silver contained in objects of luxury is commonly much exaggerated. During the French revolution, when the delivery of all gold and silver was ordered, and the order rigorously executed, the whole amount proved to be surprisingly small. When, in Prussia, during the Napoleonic wars in 1809, a tax was laid upon all precious metals in private possession, the whole amount did not reach $100,000. This statement is far more interesting, as everybody was so eager to help the country that a new order had to be issued, stating that it had not been intended that overconscientious citizens should tax their family souvenirs to an unusual value. Therefore the suspicion that the small amount may have been the consequence of many hidden treasures can not be thought of. The same tax gave similar small returns in the unlucky year of 1848.

The newspaper tales of the treasures of Oriental princes contain sometimes enormous accounts of precious metals and jewelry. Perhaps it may be there similar to what happens to be in the treasury of some European princes, where the treasures are still shown to the public, but, in fact, imitations for a large part

of the old real treasures. But even the highest number given to-day reach scarcely the treasure mentioned by ancient authorities. King Crœsus presented to the temple in Delphi 214 talents, nearly $2,000,000 of gold; Phidias used for the statue of Minerva in the Parthenon forty talents; and in the treasury of Ptolemaius Philadelphus was 740,000 talents of gold, about $13,000,000,000. Verres, during his short prætorship in Sicily, appropriated more than $6,000,000 of costly objects simply by what he called confiscation. About the mines of precious metals and their production before Christ, nothing is sufficiently known. But the immense amount of money coined in those times, the costly treasures and implements reported to have in existence warrant the supposition of their wealth. The first gold coins, stamped only on one side, belong to Asia Minor, and the stater from Phoxaia, with the seal, the emblem of the State, dated 600 years before Christ. It was followed by the Persian gold coins of Darius. Both seem to have been made of gold washed out of the alluvial layers of the Pactolus River. The money of Greece was originally of silver. The money of the Romans was at first copper, later silver; gold coins appear not before Sylla, Pompeius and Cæsar, mostly coined for the triumphal honors of those men. Later, in the time of the emperors, large numbers of gold coins appear.

By far the largest amount of precious metals has undoubtedly been used to coin money. The amount of coined money has always been very large, and followed, from 1400 to 1800, if graphically expressed by a curve, the standard of the value of both metals even nearer than the curve of the production of the mines. The advance of trade and industry demands always a larger amount of money. The lack of it has been many times seriously felt and complained of when the supply of money did not follow at an equal rate the advance of trade. The beginning of this century was marked by such a serious lack of coined money, probably by the development of trade and industry in England and North America. Perhaps the trade with China, which had to be paid in cash, with silver which never returned, may have had also some influence. The trade in tea and silk alone required to be paid by England and Russia with nearly $50,000,000 each year. Smaller sums of silver, also never returning, were absorbed by the trade with the interior of Africa. As the merchants there had nothing but the so-called Maria Theresa thaler, this coin—long ago out of use in Europe—is still made to-day expressly for this trade. The experiment to give at least a temporary help for the lack of money with notes or paper money prove to be a failure, even in states with such a firmly established credit as England. The bank notes lost in London itself, in 1814, about 26 per cent. Therefore, the coinage of large sums was decided upon, and in England alone, during the ten years from 1821 to 1832, £48,000,000 of sovereigns and £32,000,000 sterling of silver were coined. The same was done in Russia, and every miner was obliged to sell the whole product of precious metals to the imperial mint for a fixed price.

We do not know how much gold or silver coin is in existence. The numbers given by the mints, even for comparatively recent times, allow us by no means

to conclude that an average number of the coined pieces is still in existence. As gold and silver are both merchandise, they are used as merchandise when their intrinsic value is worth more than the accepted value of the coined pieces. Therefore, the value of coined money accepted by the Government is mostly a little higher than the value of the piece of metal used and the cost of coinage, which is, indeed, nothing else than a credit asked by the Government for the additional value. Nevertheless, even this method does not prevent that, suddenly, somewhere in the world, the price of precious metals makes it profitable to melt down and sell coins in bars. From 6,500,000 of guineas coined during 1817 in England, very few are in existence, as directly after the emission, and in spite of strong laws, they were melted down and sold, because the gold in bars was worth more than in guineas. From 14,000,000 of Fredericsdor coined in Prussia from 1764 to 1837, the coinage of several years has, for the same reason, entirely disappeared, and the others were only kept in existence because the Government's treasury accepted them for five and two-thirds thalers, though they were worth only five and a third. The total coinage of the United States from 1793 to 1880 is $1,438,000,000.

The deterioration of coins in circulation is considerably larger than it is commonly supposed to be. Everybody will remember having seen the older English half-crowns, shillings and sixpence, coined from standard silver (14.8), with scarcely a trace of the stamping. A careful investigation of those pieces showed that the half-crowns had lost nearly 15 per cent, the shillings 20 per cent, and the sixpences often 45 per cent of their original value. The 50,000,000 livres coined in 24, 12 and 6 sous pieces in France from 1726 to 1794 had lost, when withdrawn, according to Say's statement, one fourth of their weight. Therefore, by friction in circulation twelve million livres' worth were lost entirely in sixty-eight years. Well alloyed coins, as the Prussian thalers, show, for pieces fifty years in circulation, an average loss of 1.1 per cent. Therefore out of one hundred and five millions supposed to be in circulation each year, the value of 21,000 has been lost in the pockets or money-bags. The loss by smaller coins is, of course, larger. The chemical examination of old money-bags used in the Government treasury was made for my father, and proved that those bags contained more silver than it had been thought before. I remember the following fact which happened to occur fifty years ago in Koenigsberg, Prussia. A part of loans contracted by the Russian Empire with Hope in Amsterdam, two millions in gold, was transported in a mail coach. The gold, wrapped in paper, having become loose, had to be unpacked in Koenigsberg. The janitor of the banker, who superintended the packing, had received the old wrappings, and by burning them a jeweler found them to contain $18 gold.

The invention of photography has consumed since 1840 an enormous amount of silver, which is lost forever, as far as contained in the pictures. The production of nitrate of silver consumes year by year a large number of coins. From the smaller Hanoverian thalers before 1840, which contain a large percentage of pure silver, it will be difficult to find a specimen. The rapid disappearance of

them induced the Government to alloy the next series with iron, which is decidedly obnoxious to the photographic process, and more difficult and expensive to extract. But new chemical operations were soon equal to the emergency, and allowed some profit to the manufacturer. I am told that it is of some profit to buy old pocket-books and to extract the silver left by use on the leather lining.

The use of gold and silver for plated ware, for gold lockets, gold leaf and similar things is very large. It is difficult to get at the average loss of metal in consequence of this industry. France exported in one year about $1,000,000 of different fabrics for which gold and silver were used, and this represents probably less than one-half of this industry. If the yearly loss be accepted as 30 per cent every year about $600,000 would be lost. The United States census puts the consumption of precious metals in arts to $15,000,000 for 1880, of which $4,500,000 would be lost. Every old family knows how much lighter silver spoons, forks and similar objects grow by use, and the widely spread fashion of such objects makes it plausible that a large amount of silver is forever lost by polishing and cleaning. There are comparatively few watches without a gold or silver case, and rings and jewelry worn lose almost daily somewhat of their value. The more precious metals exist the more they are used, and the loss keeps an equal pace with their use.

Further, a very large amount of precious metals has been lost from time immemorial by ships foundered at sea, sometimes even very large in single ships, as in the so called silver fleet of the Spaniards, or in war times.

A greater amount of gold and silver in coins or ware is hidden in the ground in uncertain war times, and afterwards forgotten or not found. In Germany, the construction of roads and railways brought many such treasures to the light, which, according to the date of the coins, had been several hundred years in the ground. In Eastern Prussia alone, during the first half of this century, were found about 100 pounds of golden Arabic or Kufic coins, which must have been hidden 1,200 years or more, which proves that the tradeway in those times passed through Prussia. The well-known Hildeshelm silver found in 1867 near the battlefield of Arminius and Varus, has brought to light extremely tasteful silver vessels after twelve centuries.

Iron or earthen pots, filled with coins during the Thirty Years' War, are by no means rare. The discoveries by Schliemann in Troy and Mycenæ, and similar findings in Italy, are many centuries older. In Italy, such findings contained sometimes 30,000 coins; but, curiously enough, till now no hidden treasure is discovered which antedates the time of Sylla. More than 50,000 denares are quoted by Momsen in about a dozen different findings. The treasure hidden during the first and second century after Christ contains very large numbers of gold coins, and contrasts obviously with the small amounts during the next century. The visitor at the Copenhagen Museum will remember the heavy, solid Roman gold pieces found in the northern peat swamps.

[*To be Continued.*]

EDITORIAL NOTES.

OWING to the absence of the editor at the meeting of the American Association for the Advancement of Science, at Minneapolis, during the latter portion of August, the publication of this number of the REVIEW has been somewhat delayed. Besides this, we have only been able to give a few of the papers read at that meeting, the greater part of the issue having been in print before we left home. Those that we give are among the best, however, and others will be published hereafter.

The citizens of Minneapolis are deserving of great credit for the success of their efforts to make the meeting agreeable and profitable to the members of the Association, and this was fully appreciated by all in attendance. Such meetings are of great benefit directly and indirectly to any city where they are held, and it would be of service to Kansas City to have such an one held here. The only obstacle in the way of our holding one that would be fully as satisfactory as that at Minneapolis, is the absence of a suitable building, like the University of Minnesota, in which to hold the sessions of the various Sections, nine in number.

A REPORT entitled "The Mineral Resources of the United States" is now in press, and will shortly be published, by Mr. Albert Williams, Jr., chief of the Division of Mining Statistics and Technology, United States Geological Survey, Hon. J. W. Powell, Director. This report is for the calendar year 1882 and the first six months of 1883. It contains detailed statistics for these periods and also for preceding years, together with much technical and descriptive matter. The compilation of special statistics has been placed by Mr. Williams in the charge of leading authorities in the several branches, and the results will therefore be accepted with confidence.

NOT the least pleasant feature of the Minneapolis meeting, personally, was the expression of hearty approbation of the course and management of the REVIEW, voluntarily spoken by some of the most distinguished men present, and the surprise manifested by them that such a place as Kansas City, known to the country only as a busy commercial center, should have the taste and the disposition to support it.

WE are indebted to J. D. Carson, General Superintendent of the Union Depot of this city for a copy of an address upon "Technical Training" delivered before the Alumni Association of Lehigh University, of which Mr. Carson is a graduate.

WE have received from the Secretary a copy of the Transactions of the Kansas Academy of Science, Volume VIII, 1882–3, which will be fully noticed next month.

ALDERMAN HADLEY, of London, to whose successful efforts to establish a new American British and Canadian Cable Company we referred last month, gave a reporter of the *N. Y. World* this important item, August 1st, 1883: "We intend upon my return to England to make immediate arrangements for the full completion of the entire system, and shall proceed by laying a cable from Penzance to Sable Island, and from that point to Halifax. At the latter place we shall be connected with the entire telegraphic system of the Dominion of Canada, and by a favorable arrangement just completed with the American Postal Telegraph Company we shall have direct communication throughout the United States."

PROF. T. BERRY SMITH is again in the chair of Natural Sciences at Pritchett Institute, Glasgow, Mo., which opens September 3d.

LAST year the aggregate copper yield of Arizona Territory was 17,000,000 pounds, worth at New York rates 14½ cents per pound, $1,465,000, and it is estimated at 23,000,000 pounds for 1883, worth $3,335,000.

PROFESSOR BROADHEAD, former State Geologist of Missouri, endorses all the reports of great coal discoveries in Bates County, but says that the money expended in boring for oil there will all be wasted.

PROF. J. W. SANBORN, Dean of the Agricultural College of Missouri, is conducting a series of experiments upon the yield of different varieties of wheat and corn, the results of which he proposes to publish in a series of Bulletins, for general distribution among farmers and others.

AUGUST, 1883, will long be remembered for its earthquakes, tidal waves, cyclones, railroad and marine disasters, pestilences, etc.

THE Durango Smelting Works are receiving twenty tons of ore per day from Silverton.

PROF. WM. H. WILLIAMS, for seven years principal of the public schools, of Brownsville, Mo., has been selected as principal of the Lathrop public schools and will remove to that place very shortly.

THE sixth annual meeting of the American Society of Microscopists was held in Chicago, August 7th to 10th inclusive; Albert McCalla, A. M., of Fairfield, Iowa, President, and D. S. Kellicott, Ph.D., of Buffalo, N. Y., Sec'y.

THE predictions of the U. S. Signal Service for August 21st, included this: "For the Upper Mississippi Valley, generally fair weather, winds mostly westerly, falling barometer, stationary or rising temperature." At 6 P. M. the most severe tornado of the season swept across Minnesota, destroying the town of Rochester and killing or wounding some sixty persons.

ITEMS FROM PERIODICALS.

Subscribers to the REVIEW *can be furnished through this office with all the best magazines of the Country and Europe, at a discount of from 15 to 20 per cent off the retail price.*

THE *Scientific American Supplement* for August 25th has a very interesting illustrated article upon glass-blowing by means of compressed air. The idea is not new, but its practical application on a large scale is confined to the establishment of the Appert Bros., of France.

IN the *Electrical Review* for August 30th we find an illustrated description of a Multiple Switch-board with a capacity of 2,400 lines, made for the Kansas City Telephone Exchange. The claim is made for the exchanges using this Multiple system, that they give the most prompt and reliable service of any their equal in size, the average time in making connections being only ten seconds. It is a little remarkable that a similar switch-board made for use in London, England, is only equipped for 1,000 wires.

THE *Humboldt Library*, No. 47, presents a most valuable and interesting work, viz: The Childhood of Religions, by Edward Clodd, F. R. A. S., author of The Childhood of the World; octavo, paper, pp. 51. Price 15c.

The Popular Science Monthly for September begins with a clear exposition of "The Germ-Theory of Disease," by Dr. H. Gradle, who explains the theory, defines the extent to which it has so far been found surely applicable, and sums up the evidences on which it rests. Dr. Felix L. Oswald continues his pungent descriptions and recommendations of "The Remedies of Nature" with a paper on "Asthma" and its treatment. In "Fire-proof Building Construction" Mr. William E. Ward describes and recommends a system of building with iron and *beton* without wood, which he has tried and found practicable and effective.

DR. A. L. CHAPMAN, editor of the *Medical Era and Sanitarian*, in his September number, affirms that "there is no fact in geology or science which contradicts anything that Moses said" and declares himself ready to discuss the question "with any responsible antagonist who will pay a decent regard to the rules of logic and the facts of science."

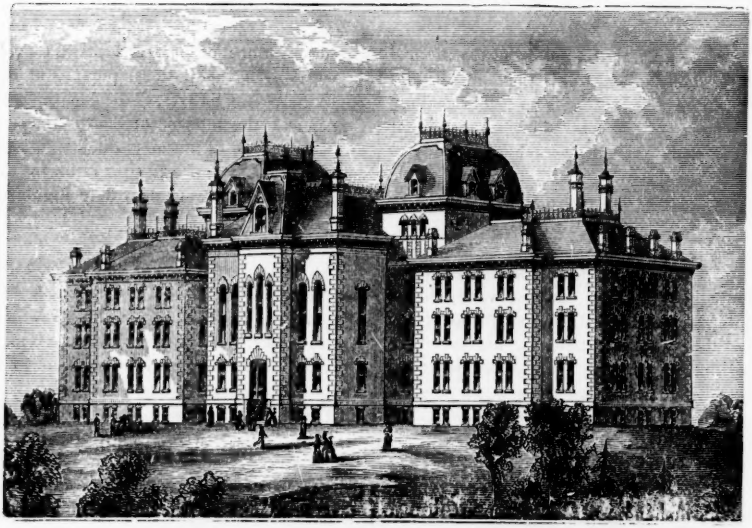
Harper's Magazine for September is an exceedingly attractive number, varied in its contents, and richly illustrated. One of the most timely of its articles is that on "Recent Building in New York"—an intelligent, critical estimate of the "New Departure" in architecture—illustrated by eighteen characteristic pictures.

THE *London Journal of Science* for August contains, among other interesting matter, an account of Dr. Edwin R. Heath's explorations in Bolivia, written by Prof. J. D. Parker. As both explorer and writer are citizens of this immediate locality and well known to most of our readers, it is gratifying to note their recognition in a magazine of so high repute in scientific circles abroad.

ONE of the most meritorious weekly publications is the "*Ausland*," of Munich, a German periodical which for the last sixty years has been succesful in popularizing the results of natural and historic science, of ethnology and anthropology; has given lucid sketches on fine arts, on new inventions, and the march of exploration and foreign travel. The present volume of the "*Ausland*" gives interesting descriptions of past and present polar expeditions, of the pastoral pursuits of the Southern African natives, of the geography of China, and the interior of South America, etc. The editor of the magazine, Prof. Ratzel, recently began to add illustrations to the instructive contents of this widely circulated sheet.

THE *Atlantic Monthly* for September, 1883, has the following table of contents: A Roman Singer, V., VI., F. Marion Crawford. En Province, III, Henry James. King's Chapel, Oliver Wendell Holmes. Our Nominating Machines, George Walton Green. Poets and Birds: A Criticism, Harriet C. W. Stanton. Newport, VI., VII., George Parsons Lathrop. Glints in Auld Reekie, H. H. Chrysalides, A. F. Annexed by the Tsar, William O. Stoddard. Along an Inland Beach, Edith M. Thomas. Merimee in his Letters, Maria Louise Henry. Character in Feathers, Bradford Torrey. Lily of Strath-Farrar, Thomas William Parsons. The Civil War in America. Mark Twain's Life on the Mississippi. The Spanish Peninsula in Travel. Two Journalists. The Contributors' Club. Books of the Month.

WE have received, too late for proper mention, the first and second numbers of the *Pattern Book of Old Italian Embroidery*, edited by Madam Frieda Lipperheide, at Berlin, Germany. They are admirably printed and superbly illustrated, and will be fully noticed next month.



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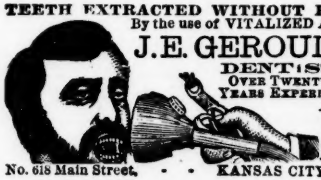

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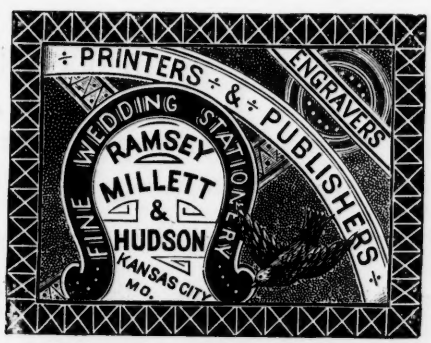

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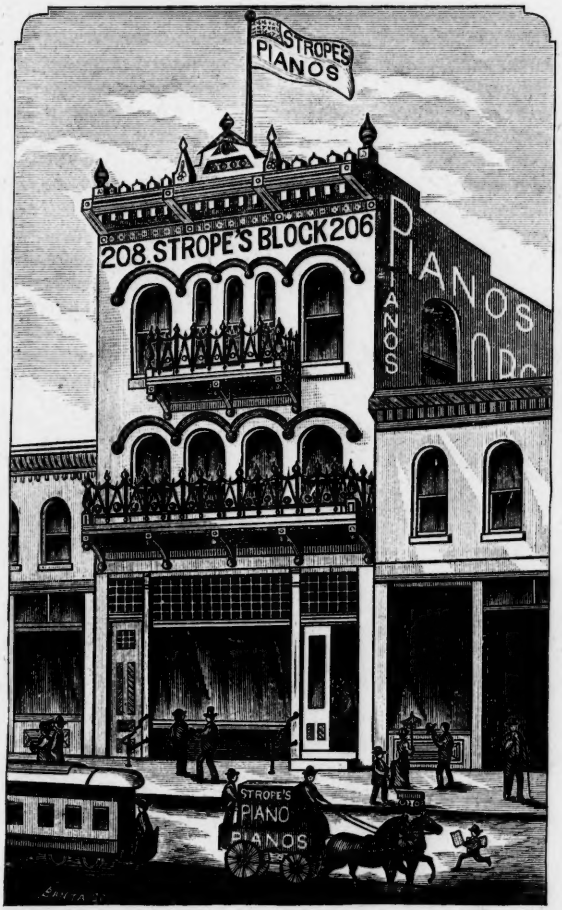

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